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BREEDING THE BLACK-HEADED SIBIA

Heterophasia desgodinsi

by Nigel Hewston

The sibilas of the genus *Heterophasia* are medium-sized crested babblers from south-east Asia which are much more arboreal than many other babblers which appear in aviculture. The sibia which has become most familiar to European aviculturists in recent years is the Black-headed *Heterophasia desgodinsi*. Those imported from China are of the nominate race and are sleek birds about 9in (22cm) long with grey upperparts, glossy blue-black head and short crest, white throat, pale grey breast, white belly, pinkish grey flanks, black wings with a white bar and a fairly long black and grey tail. The eyes, bill and legs are black. Males and females are identical in appearance but the male has a pleasant song of eight notes, falling in pitch rather mournfully at the end.

There has been some understandable confusion among aviculturists about names for sibilas. When *H. desgodinsi* first appeared in British aviculture it was generally called the Black-capped Sibia by dealers to distinguish it from *H. capistrata*, the pinkish rufous sibia with a black head from the western Himalayas which had previously been widely kept as the Black-headed Sibia, though Howard and Moore (1984) refer to it as the Black-capped. To add to the confusion, a photograph of *H. desgodinsi* in *Cage & Aviary Birds* was captioned as the Grey Sibia *H. gracilis*. Howard and Moore and King and Dickinson (1975) use the name Black-headed Sibia for *H. melanoleuca* which they consider conspecific with *H. desgodinsi*, but C. R. Robson (pers. comm. 1998) in a forthcoming field guide to south-east Asian birds, sensibly splits *H. melanoleuca*, which he calls the Dark-backed Sibia, from *H. desgodinsi* (the Black-headed Sibia) and uses the name Rufous Sibia for *H. capistrata*. Incidentally, the bird known until now as the Rufous-backed Sibia *H. annectens*, which has very recently appeared in captivity in Britain, is now thought to be not a sibia at all but a minla.

I obtained my first bird in November 1995. It had been hatched in 1993 by Peter Walker who published details of this first British captive breeding

(Walker, 1994). This bird came as a male so I acquired another established bird which had not been heard to sing in about two years with its previous owner. These two agreed well but the following summer passed with no song or other breeding activity and I became convinced that I had two females. In February 1997 a dealer offered an established true pair, and though sceptical about dealers' true pairs, one bird was definitely singing so these two were installed in the flight next to the females. After about two weeks the obvious male became aggressive to the other bird so these two were separated and each housed with one of the females. Both immediately began to sing so I now had two pairs. They remained in adjacent flights, both pairs sharing with Red-crested Turacos *Tauraco erythrolophus*, Silver-beaked Tanagers *Ramphocelus carbo* and Omei Shan Liocichlas *Liocichla omeiensis* plus White-collared Yuhinas *Yuhina diademata* in the case of one pair and with Japanese Waxwings *Bombycilla japonica* in the case of the other and both pairs at various times with Palawan Peacock Pheasants *Polyplectron emphanum*, Necklaced Hill Partridge *Arborophila torqueola* or Wonga Pigeons *Leucosarcia melanoleuca*.

These are active and acrobatic birds which are obviously largely insectivorous and catch a lot of their food on the wing (they have a useful liking for wasps), but they readily take a variety of foods in captivity including Universal Food, soaked mynah pellets, chopped fruit (especially pear), soaked sultanas and mealworms. In the wild they, and other sibias, also take nectar and berries (C. R. Robson pers. comm. 1998), frequenting as they do forest edges where flowering and fruiting trees and shrubs are more numerous than in dense forest. They are hill birds, and though not occurring up into the coniferous zone like the Rufous Sibia, they are quite hardy and can be kept outdoors all year round. My aviaries have enclosed shelters with minimal heating and the sibias have usually used these for roosting in winter but have sometimes roosted outside with no apparent ill effects in the parts of the aviaries which are roofed and screened on three sides.

In June 1997 the pair which included the captive-bred female built a rather flimsy nest, mainly from coconut fibre, in the base of a large but very open willow basket in a fork in some dead juniper branches about 1.5m (5ft) above the ground. One egg, blue with indistinct red-brown blotches, was laid on July 5th. The female looked sick after laying and incubation did not commence until the 8th, apparently by the female only, and was very erratic, even after the male started to assist two days later. After a couple more days, incubation became much more consistent but was again carried out almost exclusively by the female (now looking much better) for the rest the incubation period. The egg hatched on July 24th, and the chick was fed by both parents on insects caught in the aviary plus waxworms which were taken by both parents and white-skinned mini, then regular mealworms which

were taken only by the male. When the chick was nine days old grasshoppers were introduced. These were offered in an aquarium, and taken only by the female, probably because the waxworms ran out at this point. Grasshoppers are obviously not a natural food for these arboreal birds, and she was initially unsure how to deal with them and took a very long time to remove the legs etc., before taking them to the nest, in contrast to Omei Shan Liocichlas which deal with grasshoppers very quickly. Her efficiency with and enthusiasm for grasshoppers increased quickly and she continued to feed these to the chick while the male fed mealworms. Both parents took food items to the nest one or at most two at a time, and always turned them so that they lay along rather than across the bill before approaching the nest, also in contrast to liocichlas which carry beakfuls of insects puffin-style to the nest. The chick fledged at 17 days, flying and perching well and apparently almost as large as its parents but with its tail about one-third grown. It had a pale yellow gape and less, and duller, white in the wing than the adults. A few days after fledging both parents were seen to feed the chick with sultanas. It was still being fed with insects and mynah pellets three weeks after fledging, by which time its tail was fully grown. In September the female once again looked sick and was found to have a distended abdomen, a condition which I now realised had been present throughout the breeding season but which I had noted as a change in her stance and plumage without identifying the cause. She did not respond to treatment and post mortem examination showed gut abnormalities probably caused by an earlier alimentary blockage or injury.

This pair showed little aggression to other birds in the aviary, which measured 4.25m x 4.85m (14ft x 16ft) with a 1.5m x 1.7m (5ft x 5ft 6in) shelter. The female of a pair of Silver-beaked Tanagers would have been killed if not removed, but only because she insisted on trying to build a nest close to the sibias' nest. A male Omei Shan Liocichla was also removed when it was seen inspecting the sibia chick very closely on the day of hatching. The male tanager, female liocichla and seven waxwings were ignored unless they were close to the nest. There were no turacos in the aviary during breeding.

The young bird over-wintered with its father and in the spring of 1998 they showed some interest in nest sites, but only seemed to visit the sites independently. In May they fought and the younger bird was removed to an adjacent flight. I had not heard the bird singing but suspected that it might be a male so was reluctant to put them together again. Subsequent observation failed to produce any definite indication of sex and I am now sure that this bird was a female.

The other pair got no further than carrying nesting material in 1997, but early in May 1998 became seriously interested in building a nest on the end

of a large perch at the most exposed end of the aviary. After a few days it was apparent that they were determined to use this site so a wire basket was fixed up, screened from rain and predators with correx and minimal conifer cover. This was adopted immediately and incubation of a clutch of three eggs began ten days later. This pair, housed in a 7.3m x 3.6m (24ft x 12ft) aviary with a 2.4m x 1.2m (8ft x 4ft) shelter, were much more aggressive to other birds. A White-collared Yuhina was found dead the day after the nest site was put up, so its mate was quickly removed. A pair of Silver-beaked Tanagers and their newly fledged chick were next on the hit list and these were also removed. Some male liocichlas had already been taken out when the tanagers nested to reduce competition for livefood, leaving only a pair of Red-crested Turacos and a single Wonga Pigeon. The sibilas confined the turacos to one end of the aviary (fortunately the end containing the turacos' nest and access to food and shelter) for the whole of their nesting period. The pigeon, surprisingly, was usually tolerated quite close to the nest.

After 14 days incubation by both parents one chick hatched in the morning and the second was hatching in the evening. The third chick was assumed to have hatched the next day. On the first day the parents were catching flies etc., but not taking white mini mealworms, but they were soon taking waxworms, white mini and regular mealworms and even brown-skinned mealworms when necessary.

Fledging was the most difficult period. The first chick fledged on June 10th at 15 days. It appeared to have returned to the nest at night, but when the other two fledged the next day they could not be persuaded to do likewise nor to roost anywhere else safe. Wherever one settled the parents would clear the area of turacos, and the turacos in escaping would disturb, or in one case attack, one of the others. The weather was also far from pleasant and the chicks were placed in a small cage in the shelter overnight. The next morning the parents were shut in the shelter and the chicks let out of the cage. After a week the pop-hole was opened but the first chick to venture out took flight when the pigeon flew, hit the wire and fell down concussed. It looked close to death but after a while in a box it was able to stand and was released back into the shelter (where the other sibilas had been re-confined) and made a complete recovery. The next day the pop-hole was re-opened but only slightly so that the adult sibilas could get out but the turacos and pigeon could not get in, and the young sibilas were unlikely to get out.

This worked well and the next day the adults were adding material to the nest. This pair also used mainly coconut fibre, but also grass, moss and some finer material for lining. They relined the nest, so substantially that they really built a second nest on the first one. After a few days the young birds were also given access to the flight. On June 29th an egg was laid

from the perch, and another laid in the nest four days later was incubated for two days before disappearing. To avoid disturbance by the young birds these were removed on July 11th, about a month after fledging, but another egg laid four days later also disappeared. A final clutch of two eggs laid on July 25th and 26th or 26th and 27th did produce a chick which hatched on August 10th and fledged on the 25th. This bird unfortunately died with a respiratory infection at the end of October.

The three first-round young continued to thrive and proved to be males. Two were singing by the end of July and the third early in August. The first started quietly but soon became an accomplished and vigorous singer, the second started with the first half of the song and gradually progressed to full song, while the third stuck with the first half. During this period these three were housed together (with no friction), in sight and sound of their parents, the other adult male and the 1997 female which may have stimulated them to sing so persistently at such an early age.

I assume that the behaviour of the second pair was more typical, with incubation shared, though Walker records that only the female of his pair incubated. Both my pairs chose relatively, in one case conspicuously, exposed nest sites when more secluded sites were available. Neil Owen (pers. comm. 1998) also bred *H. desgodinsi* in 1998 after removing two birds from a large well planted aviary because they had shown so little interest in breeding that he thought they were two females. On being moved into a relatively bare former parrot aviary the male began to sing immediately, and the pair had a nest in a few days and reared two broods.

I was able to exchange young birds with Neil Owen and have also passed on young and adult birds to another experienced Avicultural Society member who already has some unrelated birds. I have reluctantly decided not to continue with this species as it is too aggressive when breeding for my community aviaries. It is a good subject for establishment by keepers who have flights for individual pairs. *H. capistrata* bred in Britain from 1925 (Sheriff, 1925) through to the 1970s when it bred for Gordon Illsley, Chester Zoo and R. Franklin, and into the 1980s with Alan Griffiths, but seems unlikely to be with us much longer. If a few breeders take an interest in *H. desgodinsi* it may persist in our aviaries after the current trade boom in birds from China, which surely cannot be sustainable, has subsided.

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MULTI-GENERATION BREEDING OF STONE CURLEW

Burhinus o. oedicnemus AT POZNAŃ ZOO

by Piotr Cwiertnia

Introduction

The nominate race of the Stone Curlew *Burhinus oedicnemus oedicnemus* has become one of the most endangered species of birds in Europe. In spite of a still quite large European population estimated at 32,690-45,704 (37,299), there has been a marked decrease in overall numbers, and in many areas it has become extinct recently (Nipkow, 1997; Cramp, 1983). Only extensive activities undertaken in Great Britain leading to the conservation of this species in the wild through strict nest protection (Green, 1986) has resulted in a slow increase (del Hoyo et al. 1996). In Poland the number of breeding Stone Curlews has decreased critically during the last few decades (Tomialojć, 1990). Therefore it is important to perfect captive breeding techniques for the Stone Curlew, as this may soon be the only chance to safeguard the survival of this species.

At the end of 1997, there were 73 Stone Curlews in 13 zoological gardens, 56 of which were captive bred (ISIS, 1997). Between 1958 and 1992, 211 Stone Curlews were hatched in 17 institutions (races not specified in the *International Zoo Yearbook*). All of the Stone Curlews hatched in the 1997 originated from just six pairs, of which two were in Poznań, and the other four were maintained in Clères (France), Paignton (UK), London (UK) and Vienna (Austria) (ISIS, 1997). The largest number of Stone Curlew ever hatched (129), was at Great Witchingham (UK) (*International Zoo Yearbook*). The original pair came from the wild (Wayre, 1971). It is likely that the majority of Stone Curlews living in captivity at present originate from this pair.

The History of Keeping Stone Curlews at Poznań Zoo

The first Stone Curlews arrived in Poznań Zoological Garden on October 21st 1986, from the Norfolk Wildlife Park at Great Witchingham. There were three pairs, probably bred there in 1986. Unfortunately, during 1987 two females and one male died. Two more females were imported from Great Witchingham on February 25th 1988, but both died the same year. To provide some much needed additional genetic variability, in 1996 we imported from Ramat Gan, in Israel, three birds injured on migration and not suitable for release.

The first pair of Stone Curlew (P1) was formed in 1989. They laid two fertile eggs, and both chicks were reared. They laid their next clutch in 1992 after a two-year break, and subsequently laid regularly every year until

1997, when both birds died. The second pair (P2) was established in 1993 from an individual originated from Great Witchingham and one reared in Poznań, but this pair laid infertile eggs only. The third pair (P3) was formed in 1996 from birds reared in our zoo, and in that year this pair laid 10 eggs from which two chicks were raised. These birds belong to second generation raised in our zoo and third or more generation raised in captivity.

From Stone Curlew raised at Poznań, in 1997 we created a fourth pair (P4) which laid two infertile eggs, this time inside the shed. This pair was the first to incubate their eggs themselves. Shortly before the completion of the incubation period, one of eggs was swapped for a newly hatched chick, but this ended in failure, when two days later the chick was killed by the foster parents. In the same year, two additional pairs were formed, one (P5) laid four eggs but all were broken by the birds themselves, and the other pair (P6) failed to lay. The latter was the third pair created during the year and involved the birds from Israel.

Table 1. Pairs created at Poznań Zoo

	Date of Hatching Parent A	Date of Hatching Parent B	Origin	Year of Pair Creation
P1	05.1986	05.1986	Great Witchingham	1989
P2	unknown	unknown	Poznań/ G. Witchingham	1993
P3	04.06.1994	03.06.1989	Poznań	1996
P4	14.06.1994	16.06.1994	Poznań	1997
P5	02.06.1994	07.06.1995	Poznań	1997
P6	unknown	unknown	wild	1997

The birds are not sexed and there is the possibility that pairs P2, P4 and P6 are homosexual

Housing

Upon arrival in our zoo the birds were placed in cages measuring 4.9m x 4.9m x 3m high (approx. 16ft x 16ft x 9ft 10in high). These are covered with wire mesh, with the rear walls covered with straw mats or wooden planks. There is a den measuring 1m x 3m x 2.5 m high (approx. 3ft 3in x 9ft 10in x 8ft 2in high), which is heated in cold weather so as not to allow the temperature to fall below 0°C (32°F). The cages are furnished with tussock grass, pine branches, and other materials to allow the birds to hide from visitors, and there is a shallow pool but the birds never use it.

The first pair created from birds originating from Great Witchingham, and fourth pair created from birds hatched in our zoo, have been kept in this kind of accommodation as well as a number of young birds hatched here. Paired birds are moved to off-show breeding cages measuring 2m x 3m x 2m high (approx. 6ft 6in x 9ft 10in x 6ft 6in high). The sides are covered with wire netting and at the back of each cage there is a small room measuring

1 m x 2 m x 2 m high (approx. 3ft 3in x 6ft 6in x 6ft 6in high). The cages are in a row, with five cages placed together and all occupied by Stone Curlews.

Food

The adult birds are fed once a day for five days a week. The food consists of cooked egg, cooked rice, white cheese, ground meat and ground (minced) fish. In addition, from time to time the birds also receive small laboratory mice *Mus musculus*. The preferred food is mice and then cooked egg and ground meat. We do not add any mineral/vitamin supplements to the food.

Breeding

All unpaired and young birds we try to keep together in a communal cage. Birds aged three years (which is when breeding activity usually begins) are allowed to select a partner of their own choosing. A mated pair begin to chase away other birds and is removed to another cage. A few days before egg laying begins, the birds dig a shallow depression in the ground. This is usually located in the same place every year.

The original pair chose a place near the cage perimeter, close to the path used by visitors and this was a reason why we never left them to incubate their own eggs. The third pair chose a place in the middle of the cage, but this pair usually lay their eggs outside the nest which could be because of the small dimensions of the cage. In 1997, we tried to leave the eggs with this pair for them to incubate and hatch but this ended in failure. The eggs of the fifth pair (P5) were destroyed by the birds themselves immediately after being laid.

The breeding season starts in March or April. The earliest clutch was laid on March 10th. The second egg in a clutch is laid 1-4 days after the first, with two days being the usual interval. The second clutch is laid 9-57 days later, with 12 days later being the most usual. Pairs usually lay two clutches, each with two eggs. However in 1995, after moving the original pair to another cage, they laid four clutches totalling eight eggs, but the next year this pair laid only one egg. In 1997 this pair laid three clutches. High egg laying characterised the third pair, which in 1996 laid 10 eggs, and in 1997, 20 eggs! Information about hatching results is summarised in Table 2.

The eggs are artificially incubated at 37.2°C (99°F). Incubation lasts for 25-28 days. All Stone Curlew chicks in our zoological gardens, apart from one unsuccessful effort, have been hand-reared. After hatching the young are kept in bowls, with sand on the bottom. The temperature is maintained by an infra-red heater at 30°C (86°F). We start feeding from the second day. At the beginning they receive dead cricket nymphs *Acheta domesticus* and the larvae of mealworms *Tenebrio molitor*. At the same time they receive food containing cooked rice, white cheese, ground meat and boiled egg.



Piotr Ćwiertnia

A one day old and a two day old chick in the rearing container



Piotr Ćwiertnia

Stone Curlew chick at 10 days old

When the chicks are a few days old they actively search for food, and at this time we start to feed them live crickets. During the course of the chicks' growth we change the proportions of food, slowly decreasing the quantity of insects. After two weeks we move the chicks to rearing cages. If birds grow up healthy, which is usually the case, we do not use any mineral/vitamin supplements.

Table 2. Breeding results at Poznań Zoo

Year	Pair	Eggs Laid	Fertile	Hatched	Reared
1989	P1	2	2	2	2
1992	P1	2	2	2	2
1993	P1	3	3	3	1
	P2	4	0	0	0
1994	P1	4	4	4	4
	P2	3	0	0	0
1995	P1	8	7	7	7
1996	P1	1	1	1	0
	P3	10	6	3	2
1997	P1	6	5	3	0
	P3	20	13	5	1
	P4	2	0	0	0
	P5	4	?	0	0
Total		69	43	30	19

Veterinary Problems

The main cause of death among chicks has been related to incubation (the yolk not being absorbed properly) with some chicks also being lost due to splayed legs. With adult birds the main cause of death has been through injuries, with three caused by predator attacks. In addition, two have died of avian tuberculosis.

Conclusion

Stone Curlews easily adapt to different habitat (cages here are in forest) and food. Hand-reared birds form pairs easily with little sign of imprinting.

To summarise, Stone Curlews are easy to keep and rear and provide a welcome addition to the collection of conservation minded zoos. Their breeding may in the near future have a definitive conservation value.

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REQUESTS FOR INFORMATION

Bryan Peck, who was the first person in the UK to breed the Pied Barbet *Tricholaema leucomelan*, has what he believes are three Sladen's Barbets *Gymnobucco sladeni* (or possibly Bristle-nosed Barbets *G. peli*) and a Grey-throated Barbet *G. bonapartei*, and would like to hear from anyone else who has these species.



Bryan Peck

One of three such birds imported from Uganda and thought to be
Sladen's Barbet

Dr Herbert Schifter would like to have longevity records for species of touracos and barbets in captivity.

THE BLACK CRAKE *Amaurornis flavirostris* AN EFFECTIVE COOPERATIVE BREEDER AT DISNEY'S ANIMAL KINGDOM, FLORIDA, USA

by Greg Bockheim and Shannon Mezzell

Summary

The Black Crake *Amaurornis flavirostris* possesses an unusual and fascinating cooperative breeding strategy. The crake group at Disney's Animal Kingdom (DAK) in Florida is comprised of two adult males and a single adult female. This original group has successfully bred, on display, in the African Aviary. The crakes share the aviary with 26 other African bird species and have incubated and hatched eggs at various locations



Rich Cody

African Black Crake *Amaurornis flavirostris* six months old

throughout the enclosure. Although hatched at varying elevations, all of the crake chicks were brought to an area most closely resembling a natural marsh (an area we refer to as the rice grass 'tidal zone') to be raised by the adults who were later assisted by juveniles and nestlings. Single chicks were produced from all three of the crake's first three nesting attempts. Aviary staff theorised that the crakes would rear larger broods of chicks once they had built up a support group that would assist in raising more chicks. After

raising several clutches of chicks, the crake breeding results supported the hypothesis that a larger number of participants, supporting the cooperative breeding effort, results in more chicks being raised. The data collected also demonstrated a significant decrease in the amount of time (days in age) in which nestlings and juveniles began to feed and care for their younger siblings. Our data also supports the idea that nestlings and juveniles take a more active role in the cooperative breeding association at a younger age when they have a larger peer group from which to learn.

Taxonomy, Morphology, Natural Distribution and Behaviour

The Black Crake is a member of the Order Gruiformes and is sometimes included in *Porzana*, or placed in the monospecific genus *Limnocorax*, but is inseparable from *Amauornis* on skeletal characters (del Hoyo et al. 1996). The overall coloration of the Black Crake is jet black above with softer charcoal black extending from beneath the beak through the belly to the vent. Being protectively clad, shy and secretive makes the Black Crake well suited for life in its shadowy habitat. It is approximately 20cm - 23cm (7in - 8in) in length. The crake's black coloration contrasts dramatically with its red long-toed feet and legs, chartreuse beak and orange-red iris. Both sexes look alike with the female being slightly larger.

The species is indigenous to tropical Africa and is widely distributed in areas where there are not only marshes, swamps and dense wetland vegetation, but also forested regions. The crakes' compressed and narrow bodies allow them to live secretively in their habitat. An effective hunter, the Black Crake runs and flies swiftly across water plants and dense vegetation, appearing as an indistinct small blur. Within its natural habitat the Black Crake is likely to feed upon insects and their larvae, seeds of aquatic plants, water snails, small fish and other assorted aquatic animals.

The Black Crake breeding biology involves the cooperative efforts of an extended family including juvenile family members and unrelated non-breeding adult birds. Cooperative breeding is relatively rare; it is currently known to occur in about 220 of the (roughly) 9,000 species of birds, and a smaller number of mammals and fish (Koenig and Stacey, 1990).

Cooperative Breeding in Birds

A cooperative breeding association is a reproductive system in which one or more members of a social group provide care to young that are not their own offspring. The aid-givers may be non-breeding adults and juveniles, in which case they are usually called 'helpers' or 'auxiliaries' (Koenig and Stacey, 1990). Care given usually includes providing food and may involve other parental-type behaviours as well, including territorial defence, nest construction, incubation and defence against predators. When observing

the cooperative breeding association among birds, one imagines that the juvenile assistants are actually apprentices, practising skills they will later use in their own nesting attempts. 'Helpers' or 'auxiliaries' themselves are beneficiaries of the cooperative breeding arrangement, not only by increasing their efficiency and experience when rearing their own broods but also because they have access to the resources and safety of the parent birds' territory.

We shall use the following definitions, as described by Skutch (1987) when describing the members of the cooperative breeding association of the Black Crake.

From hatching until it leaves the nest, a bird is a 'nestling'. 'Fledgling' or 'chick' designates a bird that has left the nest but is still dependent on parental care. In the months immediately following the attainment of independence, a bird is a 'juvenile'. In the breeding season directly following that in which it was hatched, when it is approximately one year old, it becomes a 'yearling'. 'Non-breeding adult' designates all full-grown birds not directly engaged in reproduction, whether they are or are not physiologically able to breed - a point often difficult to determine. 'Breeding adults' are mature individuals engaged in the production of their own descendants. They may be about a year old, and therefore 'yearlings' but to avoid confusion we shall reserve this designation for individuals who do not breed, those who in many cooperative nesting associations are the most numerous class of helpers.

Skutch lists intraspecific helpers in reproductive activities as: nestling helpers, juvenile helpers, yearling helpers, non-breeding adult helpers, and breeding helpers further separated into unilateral helpers and mutual helpers. Unilateral helpers are those individuals that assist others with no immediate reward (although their association with their beneficiaries may aid them in various ways) and are the most frequent kind of helper; as juveniles or yearlings they are the mainstay of many cooperative breeding associations. Mutual helpers are those that help in some aspect of the cooperative breeding association and also receive help in their production of descendants. All members of a cooperative group become mutual helpers, for they contribute to each other's welfare in diverse ways.

Young Black Crakes remain with their parents, on or in the vicinity of the home territory, guided by adults and older siblings and shielded by them from many dangers. Like most cooperative breeders, they reside throughout the year on the defended territory. As described by Skutch (1987), advanced cooperative breeding birds, like the Black Crake, tend to lack colourful plumage. Often they are black, brown or grey. He goes on to theorise that subdued coloration and the absence of conspicuous sexual differences help reduce sexual jealousy among closely associated adults. Aggressive

interactions among Black Crakes in the Disney Animal collection are uncommon and at present the group dwells in harmony.

Introduction: The Black Crake Habitat at DAK

At Disney's Animal Kingdom the Black Crakes are housed in a very large, densely planted aviary perfectly suited to a bird that one might feel prefers as little disturbance as possible in order to exist comfortably. By nature the species is secretive but we have found the birds capable of adjusting to conditions that include being visited and watched by several thousand visitors each day. Our birds have revealed themselves to be uncommonly bold and territorial guardians when holding their ground against larger birds such as Vulturine Guinea fowl *Acryllium vulturinum*, attacking even giants like the occasional human being that may enter the vicinity of their nest. The African Aviary at DAK covers an area 50m long x 20m wide x 19m high (approx. 164ft long x 65ft wide x 62ft high) and includes mature trees that create a nearly unbroken canopy overhead. A two-storey waterfall pours into pools at two different levels, intentionally flooding areas which become 'tidal zones'. A path meanders through the centre of the aviary allowing visitors a close encounter over 140 individual specimens of 28 avian species.

DAK purchased the original captive-reared crake group, comprised of two males and a single female, from the Sedgwick County Zoo, Wichita, Kansas, in November 1997. In February 1998 the crakes were introduced to their new habitat following a period of quarantine and then an introduction protocol which involves placing the birds in a 'howdy' cage on the second floor of the aviary habitat. After being released it was not surprising that the crakes chose the area closest to the waterfall and pools as their new residence. One of the areas described earlier as a 'tidal zone', a flooded area planted with rice grass *Oryza* spp., was selected by the birds as their favoured territory. Upon introduction the rice grass in this area was only 12in (approx. 30cm) tall with the water level in the area being up to 3in (75mm) in depth. This rice paddy grows along one side of a bridge that allows visitors to cross the largest pool. Other aquatic birds that share the crakes' habitat include: African Jacanas *Actophilornis africanus*, Pygmy Geese *Nettapus auritus*, White-backed Ducks *Thalassornis leuconotus*, Hadada Ibis *Hagedashia hagedash brevirostris*, Hottentot Teal *Anas hottentota* and Hammerkop *Scopus umbretta* plus a species of fish - the Tilapia *Oreochromis variabilis*.

Competition between species remains minimal to non-existent and this is likely to be due to the immense size of the aviary, the diversity of species, the birds' gradual introduction to the habitat, and individual species' populations. The arrangement and quantity of feeding stations also reduces aggressive interactions between species. Close monitoring of all avian specimens by aviary staff allows for quick action to be taken should problems arise.



Rich Cody

African Black Crake 24 days old



Rich Cody

African Black Crake four months old

The Black Crakes at DAK

The Black Crakes at DAK have laid six clutches of eggs in the months of May, June, August, September and October. The first five clutches consisted of four eggs, the sixth contained five eggs and was replaced with dummy eggs. The first three clutches produced one chick each; the female abandoned incubation within 48 hours of the first chick hatching. It is theorised that more chicks would have hatched in at least the third clutch if the female had continued incubating (two eggs in this clutch contained fully developed embryos that were near to the point of hatching, if not already pipping). The fourth clutch consisted of four eggs which all successfully hatched and the resulting chicks were then reared by the group. The fifth nest produced two chicks. The sixth clutch was replaced by plastic dummy eggs that were readily accepted and 'incubated' by the birds even though they were half the size of real crane eggs. One adult mate became more alienated from the 'alpha' breeding nucleus as more chicks were hatched and reared, eventually becoming completely peripheral from the territory and therefore the group.

The nesting sites chosen by our crakes have been among tall rice grass and in dense vegetation, such as Parlour Palm *Chameadorea elegans* clusters and fallen limbs of Australian Tree Fern *Cyathea australis*. The 'alpha' pair of crakes have been the primary nest builders of the group. The crakes pull the long broad leaves of the rice grass, or palm fronds, into a central area, thereby layering or weaving together a firm nest platform. Often these platforms have been built 2-12in (5cm-30.5cm) above the surface of the water. Those built in the low shrubbery and palm clusters have been up to 8ft (2.4m) above the ground. At present, having deserted the immediate water areas, the birds are nest building in a Queen Palm Tree, more than 30ft (9.1m) above the ground. After building the initial nest platform, our crakes have lined the nest bowl with dry bamboos and eucalyptus leaves. Juvenile Black Crakes occasionally contribute by offering dried leaves to line the nest.

The female crane lays four to six eggs at the rate of one per day. The eggs are creamy-brown in colour with light brown speckles and are 23.5mm-25mm in diameter and 30mm-32.5mm in length. Each adult bird took turns incubating the eggs and occasionally was joined by another adult bird, nestling or juvenile with incubation lasting approximately 21 days. It has taken our broods of chicks 24 - 72 hours to hatch. With earlier nests our adult birds left the nest within 24 hours of the first chick hatching. In successive nests, our female remained brooding the chicks for up to four days, giving the unhatched eggs time to hatch. While remaining at the nest for this length of time the chicks that hatched earlier have gone for 'walks' within close proximity to the nest, all the while being brooded and fed by

older nestlings, juveniles and adult birds. After the female left the nest much of her time was spent brooding the newly hatched chicks, but she soon left the chick-raising responsibilities to other group members and selected a new nest site in which to lay her next clutch of eggs. During the incubation process the 'alpha' male built one or two brood nests near to where the clutch was being incubated. Our crakes' first two clutches were laid in more distant locations, away from the aviary pools and rice grass, largely out of our view. Chicks that were hatched in these more secluded nests were brought to the vicinity of the aviary pools and brooded in dense vegetation. Later clutches were hatched and reared in nests built just above the surface of the water in the rice grass, within clear view of aviary staff and visitors.

Defence of territory, eggs and young have been behaviours observed among adult and juvenile crakes over the age of three months. Skutch (1987) explains that juvenile birds participate in the group breeding effort with less diligence and efficiency than yearlings and older birds. In nest defence, especially against human intruders, youngsters often protest more vehemently and take greater risks than older birds.

Complete mutual helpers share in every stage of nest building, incubation and rearing. Very few of our juvenile crakes fill this category. Only the 'alpha' male of the adult breeding pair has been observed fulfilling all of the characteristics of the mutual helper. This 'alpha' male has dominated each of the tasks that make up the cooperative breeding effort, from nest building to chick rearing. The female of our 'alpha' pair was the main care-giver for the first three days, partaking in a major portion of chick feeding and brooding, but soon left the task of immediate care to the 'alpha' male and juveniles. She then began to lay another clutch, usually within 22 days, in one of the chosen brooding nests that the 'alpha' male has built within the territory.

Mutual preening (allopreening) is often a behaviour associated with birds that are very bonded, although allopreening has not been a frequently observed behaviour among our group of crakes. Frequent exchanges of food between birds, chick brooding and nest sharing (behaviour in which juveniles and/or adult birds sit side by side in a nest) are the most frequent means of social contact and bonding-type behaviour that we have observed among our crakes. Exchanging of food occurs between adult to chick, adult to juvenile and fledgling, juvenile to juvenile, and juvenile to fledgling. All mature crakes, juveniles and fledglings have been observed feeding nestlings from two days of age. Our youngest fledgling recorded as feeding another group member, nestling or juvenile, was aged 27 days. Thus the period in development, from fledging (still dependent on its parents) to juvenile must be a relatively short stage. It is likely that a 7-14 day old chick can feed

itself and begins to feed its younger siblings at around 20-27 days old, but is certainly not capable of completely fending for itself given that it has yet to learn all the skills necessary for survival. Juveniles and fledglings have been observed feeding adults and then adults returning the same morsel to the same bird, or turning around and feeding it to another group member. Adult-to-adult feeding (birds over the age of 12 months) has only been observed when the female is incubating eggs or brooding nestlings; in these instances it has been the 'alpha' male that has been observed feeding the 'alpha' female. This is not to say that adult birds or juveniles do not feed each other during other times of the year. Although infrequent, juveniles from the age of 37 days have been observed feeding, incubating or brooding nestlings. Many of the group 'helpers' (adults, juveniles and fledglings) seem to so urgently 'need' to feed another group member that they will feed any other crake, adult or juvenile, that approaches them or that they walk upon. The urge to feed newly hatched chicks, and any other crake that inhabited the immediate crake territory, was most recognizable in the 'alpha' breeding male. Along with this 'alpha' male, juveniles between the ages of 4 - 12 weeks of age appear to possess the strongest nestling feeding instincts. Single nestlings that were the lone survivors of broods were documented as having a more urgent and earlier feeding instinct than those chicks hatched among broods with more than one member. The first three crake clutches to hatch, at DAK, fledged single chicks. Each of these chicks diligently cared for the four nestlings which hatched in the fourth clutch. When this clutch of four hatched, the three older juveniles began feeding the brooding female; she in turn fed the chicks that she was brooding.

The age at which our crake chicks were observed actively foraging and feeding on their own varied from 7-14 days. The age at which chicks were observed actively foraging on their own decreased as the number of juveniles in the cooperative breeding group increased. For example, the first chick to hatch in the collection, a single chick which hatched from a clutch of four eggs, was not observed to feed on its own until it was 23 days old. The youngest chicks to be observed feeding on their own were those hatched among a group of four hatchlings; they were seen foraging when seven days old. The shorter length of time that chicks exhibited foraging and feeding behaviour may be attributed to the increased number of older juveniles serving as role models and 'teachers'. At the time this brood of four chicks hatched, three broods of single crakes had reached independence bringing the peer group to three adults (the nucleus adult breeding 'alpha' pair and peripheral male) and three juvenile birds from the first three clutches. Adults, juveniles, fledglings and nestlings could easily be observed foraging in the 'tidal zone' from the visitor bridge. The crakes at Disney's Animal Kingdom are identified using colour-coded bands and small cable ties. Tossing

individual birds waxworms allowed us to observe exactly who was fed and at what age the associative activities that make up the association between cooperative breeding birds took place. The foraging and feeding habitat the crakes preferred were the shallow waters in which the rice grass grew, even nestlings hatched in the upper forested areas of the aviary, or in mid-canopy, were brought down into the 'tidal zone' (rice grass) areas within three days of hatching.

Fledgling and juvenile crakes have been observed participating in incubating eggs only for brief periods. From the age of 37 days, fledglings and juveniles have also been observed brooding nestlings. Juvenile and fledgling crakes have been observed brooding younger nestlings more frequently than they have been observed incubating eggs. The increased instances of brooding behaviour by juveniles and fledglings is likely to be due to the nature of the chick. Searching for warmth, the precocial very mobile chick has the capabilities of approaching another crake, of any age, and being brooded.

A Change in Territory

The crakes have moved to the tops of three large Queen Palm Trees making them significantly more difficult to observe. The crakes may have deserted their rice grass territory because of recent fluctuating water levels, increased visitor numbers or because of the present decline of the mature rice grass. Their departure may have also resulted from the interference they experienced when their latest clutch of eggs was replaced with artificial eggs in an effort to avoid over-populating our crake habitat. With less human disturbance and replanting of the dense rice grass 'tidal zone', the crakes may return to this habitat.

Conclusion

The Black Crake possesses an intriguing and remarkable cooperative breeding strategy. The Black Crake group at Disney's Animal Kingdom suggests that the crakes' reproductive success improves if there are more helpers to take part in the task of raising chicks. The data collected also demonstrates a substantial change in the age at which fledglings begin to feed on their own. Chicks that have a greater number of older siblings begin foraging and feeding on their own at a younger age (seven days of age as compared to 23 days). A very small association seems to exist between our mature peripheral male, part of the original nucleus of three adult birds, and our 'alpha' breeding pair. This male continues to live on the outskirts of the 'alpha' territory and is not an active member in the cooperative breeding association. It has not been determined why this male has not become an inclusive member.

Acknowledgments

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INCA TERNS BREED AGAIN AT THE NATIONAL ZOOLOGICAL PARK

By Sara Hallager

The Inca Tern *Larosterna inca* is found in the Humboldt Current region of South America from northern Peru south to Chile. It is not considered globally threatened, but populations are vulnerable especially to weather phenomenon such as El Niños (del Hoyo et al. 1996). White feathers on either side of the base of the bill curve back and downwards and yellow wattles at the corners of the bill contrast strikingly with the slate blue feathers which cover the body. The Inca Tern is the only species of tern that nests in deep crevices and caves (del Hoyo et al. 1996). Because of its unique physical appearance and unusual breeding behaviour, the Inca Tern is placed in its own monotypic genus, *Larosterna*.

At the National Zoological Park (NZP) in Washington DC, Inca Terns are exhibited in a large, free flight aviary from April to November. During the winter months, they are housed off-exhibit in a heated building. Measuring 26m tall x 41m wide (85ft tall x 135ft wide), the aviary also houses Scarlet Ibis *Eudocimus ruber*, Roseate Spoonbill *Ajaia ajaja*, Little Blue Heron *Hydranassa caerulea*, Cattle Egret *Ardeola ibis*, Green Heron *Butorides virescens*, Double-crested Cormorant *Phalacrocorax auritus*, Green-winged Teal *Anas crecca*, Wood Duck *Aix sponsa*, California Quail *Lophortyx californica*, Ring-necked Pheasant *Phasianus colchicus* and Roadrunner *Geococcyx californiana*. Visitors are able to walk through the aviary on a central path. The aviary is planted with mature, evergreen and deciduous trees, small bushes and ground cover. In the centre of the aviary, there are a series of large, 10m (30ft) high artificial rock cliffs, at the base of which there are three pools.

History of the flock

Inca Terns formerly bred at the NZP from 1974-1983. During this time, they were in a smaller aviary. Throughout these years, a total of 22 chicks were hatched. The parents were rarely successful in rearing their chicks however, and hand-rearing was a frequent necessity (Tomassoni per. comm.). From 1983-1991, the number of terns fluctuated between two and 12 birds. Egg production in the flock continued until 1988, and then ceased. None of these eggs were fertile. The terns were fed Nebraska brand Bird of Prey diet.

In 1992, following the introduction of seven captive born individuals, 12 Inca Terns were moved to the large aviary where the species is housed today. The diet was changed to Zupreem canned feline diet mixed with

Mazuri® Sea duck pellets and Ziegler® flamingo fancier pellets. A calcium supplement was sprinkled on top. This diet was also fed to all of the other carnivorous birds in the aviary. In 1995, bill abnormalities began developing in six of the captive hatched terns. The bills became severely overgrown and began to split lengthwise. A diet too high in protein was thought to be the problem. A change to an all fish diet was implemented in 1996.

This new diet comprised a variety of fish including Smelt *Osmerus mordex*, Butterfish *Peprilus triacanthus* and Capelin *Mallotus villosus* fed twice a day, with Smelt being the predominant fish fed. A powdered supplement of Vitamin E and thiamin was sprinkled over the fish along with calcium powder. Over the course of the following year, bi-annual bill trims eliminated the bill deformities in all but one bird. Hand-feeding the terns fish allowed them to fill up on fish and not canned cat food, which was still fed to other species in the exhibit. Beginning in 1996, nest-boxes were provided, which were square in shape and featured a square shaped entrance tunnel. Sand was placed inside the boxes. Proof that the terns were investigating the nest-boxes was evidenced by the displacement of the sand inside the boxes. Breeding activity was still not observed.

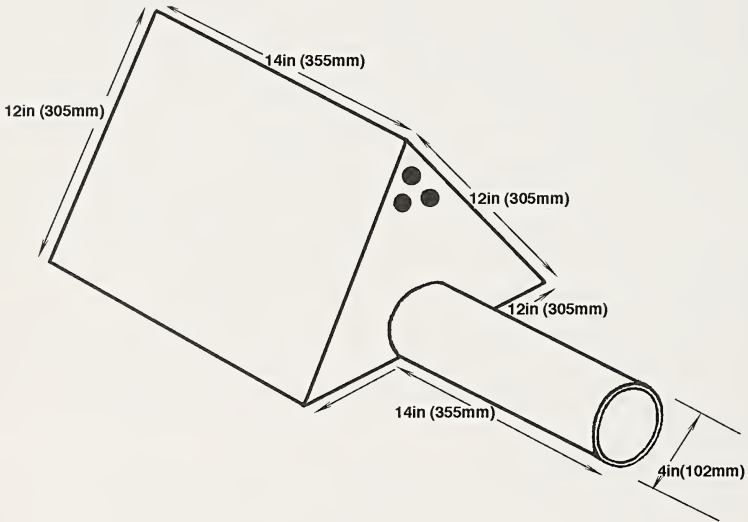
In addition to the new diet described above, goldfish were offered as a weekly treat starting in 1997. The terns continued to investigate the nest-boxes, but the 1997 breeding season did not result in any eggs being laid.

The 1998 breeding season

At the onset of the 1998 breeding season, the flock consisted of one pair of wild caught birds (estimated to be about 16 years old) and eight captive hatched birds, ranging in age from three to seven years. For the 1998 breeding season, three new nest-boxes were made available to the terns. Constructed of wood, the new boxes were triangular in shape. The bottom of the nest-boxes was also wood and a layer of sand was added inside as a nesting substrate. The face of the nest-boxes were blocked off, except for a 4in (10.2cm) hole in which a piece of PVC piping of the same dimension fitted snugly inside. Small holes drilled at the top of the nest-boxes allowed for some ventilation (See diagram). The nest-boxes were placed in locations around the artificial rock cliffs.

The terns began investigating the new nest-boxes immediately. Two weeks after placement of the new boxes, the first eggs were laid. Several days later, a second pair of terns produced eggs. To minimize disturbance, the nest-boxes were not checked until the end of the incubation period. After 26 days of incubation, both nest-boxes were inspected and each was found to contain two chicks. A third pair of terns hatched one chick several weeks later (their second egg did not hatch). Following the arrival of the chicks, all fish presented to the terns was chopped into small pieces for the parents

to offer the chicks and was provided three times a day. When the chicks were several weeks old, they began to leave the nest-box and investigate the area immediately around their nest-box. At the first sign of danger however, they quickly retreated into their nest-box. Actual flight was not observed until the chicks were 40-45 days old.



Design of nest-box in which the terns nested successfully

Although the three sets of parents of the five chicks were still on occasion feeding their now fledged offspring, two of the three pairs each produced a second clutch of eggs. Again, following a 25-day incubation period, two chicks hatched in one nest-box. The second pair of terns hatched one chick, but it was found dead the following day. The other egg in this pair's clutch pipped but failed to hatch successfully (See Table 1).

Approximately one week prior to the hatching of one pair's second clutch of eggs, an unfortunate event occurred with this same pair's first two offspring. Over the course of one week, the two juvenile terns (three months old) both died from aspergillosis and malaria.

Table 1. Summary of Inca Tern 1998 Breeding Season

Parents A & B	Chick 1- hatched June 23rd- died September 15th Chick 2- hatched June 24th- died September 25th	Chick 6 - hatched September 24th Chick 7 - hatched September 25th
Parents C & D	Chick 3- hatched June 24th Chick 4 - hatched June 25th	Chick 8 - hatched September 24th died September 25th Chick 9 - pipped/died September 25th
Parents E & F	Chick 5 - hatched July 3rd 2 nd egg in clutch did not hatch	

Summary

Several events combined to make the 1998 Inca Tern breeding season at the National Zoo a successful one. The first was the change in diet from meat to fish. Throughout the 1998 breeding season, paired terns were often seen using fish as a part of their courtship feeding. Courtship feeding has been documented in the wild in this species, and is an important part of the entire breeding cycle (del Hoyo et al. 1996). The second event contributing to the breeding success, was the new nest-boxes. In the wild, Inca Terns nest in small crevices and caves in high cliffs (del Hoyo et al. 1996). By simulating the nesting situation in the wild through the use of a length of tubing leading into a cave-like area, the terns found the security they needed to nest and rear their young.

Although four of the nine chicks died, the breeding season was still a successful one. After 15 years, Inca Terns are again breeding at the National Zoo.

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THE PURPLE-BELLIED PARROT *Triclaria malachitacea*: ITS BIOLOGY AND HUSBANDRY

by Juan Cornejo

The Purple-bellied Parrot *Triclaria malachitacea* is endemic to south-east Brazil, where the wild population is in decline. It is not very well known in captivity, in which it has a high mortality and a low reproductive rate. At the beginning of 1998, the Loro Parque Foundation, Tenerife, Canary Islands, Spain, possessed the largest collection with 21 (9.10.2) of the approximately 60 individuals in captivity outside of Brazil.

My study of this species began in October 1996 and its objectives were:

To compile the existing information on its biology and general situation in the wild.

To compile the information on its husbandry in captivity, both from the existing literature and from experience gained through keeping this species at the Loro Parque Foundation.

Name and Systematics

Scientific: *Triclaria* (Wagler, 1832), *Triclaria malachitacea* (Spix, 1824), before denominated *Triclaria cyanogaster*. *Triclaria*: Epithet from Greek mythology for the goddess Diana. *Malachitacea*: from the Latin *malachiteus* = green and *-aceus* = resemblance (Jobling, 1991).

English: Purple-bellied Parrot.

Spanish: Loro de Ventre Púrpura.

Yupi (Brazilian aborigine): Cica, Sabiá-cica (Mother of the thrush or robin).

Class Aves, Order Psittaciformes, Family Psittacidae, Subfamily Psittacinae, Tribe Arini, Genus *Triclaria* (monotypic), Species *Triclaria malachitacea*.

Ecology and Habitat

Distribution

Brazil: This species is endemic to the Atlantic forest of south-east Brazil, from south-east Bahia State south to northern Rio Grande do Sul (Arndt, 1996; Bertagnolio, 1981; Collar et al. 1992; Forshaw and Cooper, 1989; de Grahl, 1986; Low, 1994a; Ridgely, 1981; Robiller, 1990 and Sick, 1993). It has been found in the states of Rio de Janeiro, São Paulo, Paraná and Rio Grande do Sul (Collar et al. 1992). One record for Campo Grande (Sick, 1985) has been discarded by Straube and Scherer-Neto (1995) and by Collar et al. (1992).

Argentina: Two records exist: Canevari et al. (1991) identified this species in November 1986 in Provincial Urugua-i Park and Rumboll (1990) identified it in April 1983 in the National Park of Iguazú. This author justifies these movements outside the usual area of distribution, as being a search for new habitat, due to the progressive destruction of its original habitat.



Distribution in Brazil according to Robiller (1990)

Habitat

It occurs on the escarpment and in humid forest as well as in the altiplanos within its range of distribution (Arndt, 1996; Belton, 1984; Forshaw and Cooper, 1989; Ridgely, 1981; Robiller, 1990), while Sick (1993) stated that it occurs in xerophytic woodland.

In the breeding season it is found at altitudes of 300m-1,000m (approx. 980ft-3,280ft) (Arndt, 1996; Collar et al. 1992; Forshaw and Cooper, 1989; Robiller, 1988, 1990). Outside the breeding season they group to carry out displacements towards the lowlands of the coast (Collar et al. 1992; Forshaw and Cooper, 1989; Sick, 1968, 1993), as do Pileated Parrakeets *Pionopsitta pileata* (Bertagnolio, 1975, 1981; Straube and Scherer-Neto, 1995). Sick (1993) confirmed that they visit the town of Parati, Rio de Janeiro.

According to Yamashita in Collar et al. (1992) it occurs in habitat rich in bromeliace forests along watercourses in valleys. In the states of Paraná and São Paulo, according to Straube and Scherer-Neto (1995), it is restricted to dense Ambrophils forests. According to Bencke (1996) in Rio Grande do Sul it inhabits patches of broadleaf forest and pine groves of mainly *Araucaria angustifolia*.

There is evidence that during the course of the year they carry out short displacements to forests and gardens around cities (Bertagnolio, 1981; Forshaw and Cooper, 1989; Ridgely, 1981; Sick, 1968; Straube and Scherer-Neto, 1995) and to corn fields (Bencke, 1996).

Yamashita (in Collar et al. 1992) and Sick (1968) stated that they are found in the canopy of high trees. Collar et al. (1992) stated that in the Biological Reserve Augusto Ruschi they occur from mid-stratum almost to the canopy. In Rio Grande do Sul, according to Bencke (1996), they occupy the lower stratum of the forest between 5m (approx. 16ft) and 10m (approx. 32ft) up from the forest floor.

Population

Even though it is a protected species under Brazilian law (Straube and Scherer-Neto, 1995), according to Forshaw and Cooper (1989) and Ridgely (1981), although it is still common in some districts, *Triclaria malachitacea* has disappeared from most of its old range. Low (1994b) considers it to be vulnerable. Robiller (1990) considers that the population is declining but is not in danger. Lambert et al. (1993) estimated the total population to be fewer than 5,000 individuals and it is considered an endangered species by the IUCN (Collar et al. 1994).

In Rio Grande do Sul, according to Belton (1984), it is a scarce resident. Bencke (1996) considers it to be quite common in wide regions of mature forest and in a 45sq km (approx. 17sq miles) area that embraces the east-central part of the state, estimated a maximum of 10,000 individuals. Aleixo and Galetti (1997) consider it to be fairly common in the Estadual Intervales Park (São Paulo State). Straube and Scherer-Neto (1995) regard it as an unusual species in the states of São Paulo and Paraná.

Collar et al. (1992) say that its density has been underestimated due to its shyness, but according to Bencke (1996) and Straube and Scherer-Neto (1995) its habit of forming into small groups and its peculiar song make it a conspicuous species. Because of the resemblance of the female to that of *Pionopsitta pileata* and the overlapping of the two species' ranges (Bertagnolio, 1975, 1981; Forshaw and Cooper, 1989; Low, 1994a), confusion has probably arisen in some cases. All this seems to indicate that it is not a very abundant species.

Vocalisation

Its very characteristic voice, melodious and difficult to describe, is unlike that of any other parrot. It vocalizes both in flight and at rest (Belton, 1984; Straube and Scherer-Neto, 1995). Males sing more frequently and more strongly. Females can also sing. Rossi dalla Riva captured an individual with a different song. It was described as 'tone deaf' (Bertagnolio, 1981). My study of eight captive pairs found no very significant differences between

the number of vocalizations uttered by the males and females during the day. The profile showed an increase in the number of vocalizations during the first and last hours of the day (Cornejo in preparation).

Flight

Several authors describe its flight as quick, slight and precise (Belton, 1984; Forshaw and Cooper, 1989). Murray (1969) described having seen those in his aviary fly like a shrike with long glides with only the tips of the wings moving, and catch flies on the wing with the same circular flight as that of the Spotted Flycatcher *Muscicapa striata*. I found in captivity each individual carries out an average of five flights an hour, except during the early hours of the day when a larger number of flights take place (Cornejo in preparation). In Robiller (1988, 1990) Burkard affirmed that in captivity they spend most of the time flying, settling only occasionally. Evidently this behaviour is influenced by their housing conditions and surroundings.

Activity

They are most active at dawn and late in the afternoon (Yamashita in Collar et al. 1992). As is characteristic of species of humid forests they are inactive during most of the day. I found that in captivity they pass 75% of the day resting or sleeping. The greatest activity takes place during the first and last hours of the day (Cornejo in preparation).

Food and Feeding

According to Bertagnolio (1981), Collar et al. (1992), Forshaw and Cooper (1989) and Sick (1968) their natural diet is based on seeds and the pulp of different forest trees, as well as nectar and invertebrates. In Rio Grande do Sul, according to Bencke (1996), the last two foods are eaten less frequently, instead they eat mostly vegetable matter, mainly the seeds of *Pachystroma longifolium*, *Actinostemon concolor*, various fruits of the family *Myrtaceae* and sometimes Corn *Zea mays* growing in fields adjacent to patches of forest. Pizo et al. (1995) agree as to the importance of *Myrtaceae* fruits but not the importance in the area of *Euterpes adulis* (Palmito), which was considered by Bertagnolio (1981) and Collar et al. (1992) to be their principal source of food. Belton (1984) stated that they eat the pine kernels of *Araucaria angustifolia*. Citric fruits also form part of their diet and Allmenroeder in Keller (1990), Carvalho in Collar et al. (1992), Forshaw and Cooper (1989) and Sick (1968) agree that they like Lemons *Citrus medica*, of which they eat only the seeds. Pizo et al. (1995), state that they eat oranges. Bencke (1996), Bertagnolio (1981), Collar et al. (1992), Low (1972) and Murray (1969) state that they like to eat tree bark. Murray (1972) was of the opinion that their natural diet also includes leaves and Low (1972) reported that in captivity they have been seen eating leaves.

Movements and Sociability

Yamashita in Collar et al. (1992) stated that they move at the level of the tree canopy or even above it. Bencke (1996) said they will cross small clear areas *contra* Collar et al. (1992). Bertagnolio (1981) and Yamashita in Collar et al. (1992) affirm that they usually go about in small groups and according to Robiller (1988, 1990) these are especially frequent outside of the breeding season. However, almost 50 of the 106 records registered by Bencke (1996) were of pairs. According to Pizo et al. (1995) they live in pairs or small groups of up to four individuals.

Territory

Collar et al. (1992) and Straube and Scherer Neto (1995) confirmed their strong territorial instinct by getting aggressive reactions from playing recordings. Arndt (1996), Fricker (1990), Murray (1969) and Robiller (1988, 1990) found that the same strong territorial instinct exists in captive paired birds.

Reproduction

In the wild they nest from September to January (Bencke, 1996; Bertagnolio, 1981; de Grahl, 1986), or earlier (Arndt, 1996; Camargo, 1976; Forshaw and Cooper, 1989). They use natural holes in trees in which to nest (Arndt, 1996; Bencke, 1996; Bertagnolio, 1981; Camargo, 1976; de Grahl, 1986) including, according to Bertagnolio (1981) and de Grahl (1986), holes in palm trees.

Table 1. Nest and nest location.

hA	hN	E	D	Source
-	4.5m	30x5cm	90cm	Camargo (1976)
-	1.5m	35x5cm	220cm	Camargo (1976)
-	~2m	20x16cm	-	Straube/Scherer-Neto (1995)
~20m	5.13m	16x8cm	>100cm	Bencke (1996)
-	3.43m	20.5x3.5cm	35-40cm	Bencke (1996)
-	4.3m	10.5x7cm	-	Bencke (1996)
-	~12m	-	-	Bencke (1996)
-	~4m	-	-	Bencke (1996)
-	-	31.6x24.9cm	-	Arndt (1996)

hA = Nest tree height

hN = Height from the ground to the lower lip of the entrance to the nest

E = Nest entrance measurement

D = Depth of nest

Aviculture

General

According to de Grahl (1986), the first news of this bird dates back to 1820, when Príncipe Max described it, soon after an explorer named Nattere bought one in a market on the 'River of Janeiro'. The Austrian Emperor had two between 1822 and 1825 and, in 1878, a merchant named Hamburgo Lintz offered a couple to Dr. Ruá. In 1879, Messrs. Hagenbeck had one in Berlin, when the famous collection at London Zoo still did not have one. There seems not to have been any further news of any captive individuals until 1905, when one appeared in England. The first one arrived at Berlin Zoo in 1910 (Robiller, 1988, 1990). Nothing further seems to have been written about this species until two arrived in England in 1960. In 1964, the late Herbert Murray imported two pairs from Brazil and in 1968 almost achieved what would have been the first recorded successful breeding of this species in captivity, had not the youngster died in the nest. Then in 1971 Rossi dalla Riva hatched one youngster (the other egg contained a dead embryo).

At the end of 1997 the captive population outside of Brazil was restricted to pairs belonging to private collections in Italy, Germany, Switzerland, Spain, Portugal and the USA, plus those at Vogelpark Walsrode, Germany, Palmitos Park and the Loro Parque Foundation, Canary Islands, Spain, totalling altogether approximately 60 individuals.

The one that has lived the longest in captivity could be a male that arrived in January 1986 at Loro Parque, and at the beginning of 1998 was at least 13 years old.

Housing

Experience demonstrates that this is a delicate and difficult species to establish in captivity (Arndt, 1996; Bertagnolio, 1981; Fricker and Fricker, 1992; Gismondi, 1990; Krenek, 1994; Low, 1988, 1994a; Murray, 1969; Patzwahl, 1993; Robiller, 1988, 1990). Imported birds require time to become acclimatized, but once this has been overcome, become stupendous aviary birds.

In large aviaries they are able to demonstrate the beauty of their flight. The smallest aviary in which reproductive successes have been documented was 3m x 1m x 1m (approx. 9ft 9in x 3ft 3in x 3ft 3in), suspended 1.5m (approx. 5ft) above the ground, at the Loro Parque breeding facility. Bigger aviaries are, of course, preferable. They are said to like green-walled shelters (Bertagnolio, 1981; Low, 1994a). According to Arndt (1996) they should be housed in pairs in separate but continuous aviaries. Krenek (1994) housed two females with each male but only the dominant female of each trio bred, thereby demonstrating the monogamous tendencies of *Triclaria*.

Silva (1991) stated that they do not tolerate well temperatures higher than 37.5°C (99.5°F). Arndt (1996) and Collar et al. (1992) consider the minimum temperature for them is 20°C (68°F). However, Fricker and Fricker (1992) and Low (1994a) affirm that they are not delicate in low temperatures. If they have a nest-box which they like, they will roost in it at night (Arndt, 1996; Bertagnolio, 1981; Fricker, 1990; Fricker and Fricker 1992), although this behaviour is not always observed (Silva, 1991).

According to Wasilewski (per. comm.) they have a propensity to suffer from infestations of roundworms, so preventative measures must be taken in the design of their housing, the provision of prophylactics and other veterinary measures.

Diet

The basic diet provided for them at Loro Parque is the same as that provided for most of the other parrots in the collection. The food is prepared daily in the approximate proportions listed in the Appendix (p. 37). They are fed twice daily: the first feed is given at 8.30am and includes a dish (D1) containing fruits and vegetables (Group 1) mixed with small seeds (Group 2). A second dish (D2) contains two types of pellets (Group 3). At the second feed, at 2.30pm, the first dish (D1) is replaced by another dish (D3) containing legumes and large seeds (Group 5), together with small seeds (Group 4). Calcium and vitamin/mineral supplements are added to Group 4. This routine is designed to induce the birds to eat more vegetables and fruits than they would eat if these were served together with the seeds and legumes. The birds are hungrier in the morning and more eager to eat whatever is served up for them. Twice daily feeding also mimics the foraging habits of the birds in the wild because since not all their food is served up at once, they are able to choose new food items throughout the day (Lafeber, 1991; Harrison, 1986; Reese, 1991). In the breeding season, the basic diet is enriched with a homemade cake, the ingredients and preparation of which are detailed in the Appendix.

At Loro Parque each pair receives 155g of food each day, of which each individual, consumes about 12g fruit and vegetables, 14g seeds and pulses, 1.2g pellets, with everything accompanied by 6ml water. Of the various items in the diet, they have a preference for pear, apple, guava and pepper, as well as the corn and sunflower seed (Cornejo and Wolf in preparation).

Each pair has its water changed twice daily. A calcium block made at Loro Parque (See Appendix) is available at all times. As well as providing the birds with calcium, it is abrasive and helps them keep their beaks in good condition.

The calcium supplement used is Calcic Carbonate Carmisur, S.L., the vitamin/mineral supplement is Pet Chef Professional Breeder Supplement,

the pellet is the Pretty Bird Hi-Energy Special and the commercial mixture of small seeds is marketed by Wilde Zaden of Dufky.

In 1993 the diet also included boiled chicken once a week and, occasionally, mealworms *Tenebrio molitor* (Patzwahl, 1993). During the time that this diet was used the breeding results were remarkably good, with three pairs raising a total of nine young.

Reproduction

The following authors have documented the breeding of this species in captivity: Bertagnolio (1981), Fricker (1990), Fricker and Fricker (1992), Krenek (1954), Low (1988 and 1994a), Murray (1969), Patzwahl (1993), Robiller (1988 and 1990) and Silva (1991).

Display and mating

The breeding season at Loro Parque starts at the beginning of the winter. The first signs of reproductive behaviour are usually the increased activity and aggressiveness of the males.

Males can begin to display from the age of one year old. At Loro Parque the youngest breeding pair were a two year eleven month male and a two year nine month old female.

During the display the male walks along the perch with his body inclined or held erect, raising the feathers of his head and mantle and spreading the tail. He shakes his head rapidly and vocalizes and at the same time dilates the pupils of the eyes, producing a very attractive effect. According to Low (1994a) and Robiller (1988, 1990) the females also sing and shake their heads. The dilation of the pupils is common in other Neotropical parrots, such as those of the genus *Amazona* and also in species of the mainly Asian genus *Psittacula*.

Consistent with a chick requesting food, the male also leans forward until touching the perch and sings strongly while shaking the wings lightly, in response to which the female regurgitates food and gives it to him. In other species of Neotropical parrots, such as the Amazons, it is exclusively the male that regurgitates food and only the female that solicits it. With *Triclaria* I found that both sexes indulge in this behaviour with the same frequency (Cornejo in preparation).

Bertagnolio (1981) and Silva (1991) observed the male mating with one foot on the perch and the other on the female's back.

Nest

The few documented breeding successes in captivity have taken place in vertical wooden nest-boxes. These have varied in size from 20cm-30cm x 20cm-30cm x 40cm-60cm high (approx. 8in-1ft x 8in-1ft x 1ft 4in-2ft high).

At Loro Parque breeding successes have been achieved using vertical wooden boxes and boxes fixed at an angle of 45 degrees, both with an entrance hole between 7.5cm and 10cm (approx. 3in-4in) in diameter and with 15cm (approx. 6in) of sawdust in the bottom of the box. Krensek (1994) obtained good results using wooden lined metal boxes.

Chicks and Eggs

In captivity in the Canary Islands and England they nest during January to May. The female spends some time in the nest-box before laying (Bertagnolio, 1981 and Silva, 1991). She lays on alternative days and the normal clutch consists of four eggs, although smaller clutches are not unusual. The biggest documented clutches are of seven and eight eggs and were obtained by Krensek (1994), who removed the eggs as the female laid them. They lay one clutch a year, but according to Silva (1991), if the first clutch is lost or removed, they lay again one month later but if the same thing happens again, will not lay for a third time.

The eggs normally measure 31.5mm x 24.5mm (Bertagnolio, 1981; Krensek, 1994; Nichols in Forshaw and Cooper, 1989; Robiller, 1988, 1990). The smallest eggs do not usually hatch (Low, 1988, 1994a). According to Robiller (1988, 1990) a fertile egg weighs 10.2g on the day it is laid.

Incubation

The females are usually tight sitters (Murray, 1969; Silva, 1991). According to Bencke (1996), Low (1994a), Patzwahl (1993), Robiller (1998, 1990), Silva (1991), Sweeney (per. comm.) and Vriends (per. comm.) the average incubation period is 28 days. Incubation begins with the laying of the first egg (Silva, 1991).

The males feed the females during incubation (Bencke, 1996; Bertagnolio, 1981; Murray, 1969; Patzwahl, 1993) and occasionally continue doing so until the chicks are one month old (Silva, 1991). Krensek (1994) artificially incubated 10 eggs at 37.3°C (99°F) and 50% humidity, and seven hatched successfully.

Chicks

Newly hatched chicks weigh 7 ± 1 g (Low, 1994a) and have long, white down on the wings, back and underparts (Bertagnolio, 1981 and Silva, 1991). The ears and eyes are closed (Low per. comm. and Silva, 1991) *contra* Bertagnolio (1981). The claws are grey (Silva, 1991). According to Low (per. comm.) and Krensek (1994) the eyes begin to open about the 19th or 20th day and the ears a few days before this. The second down is light grey and appears about the 14th day. The pin feathers appear during the fourth week (Krensek, 1994).

The chicks remain in the nest for between seven and eight weeks (Arndt,

1996; Fricker, 1990; Fricker and Fricker, 1992; Low, 1992; Patzwahl, 1993; Silva, 1991; Sweeney per. comm. and Vriends per. comm.). Rossi dalla Riva in Bertagnolio (1981) affirmed that during the last few days the chicks are in the nest, it is the male that is in charge of their feeding. According to Silva (1991) and Patzwahl (1993) the chicks continue to be fed by their parents for four or five weeks. Bertagnolio (1981) and Low (1994a) agree that the chicks closely resemble those of the Pileated Parrot *Pionopsitta pileata*, while to Silva (1991) they are reminiscent of those of the genus *Pionus*.

Triclaria chicks have been hand-reared in several collections. Low (1988) used Nestlé cereals for babies, germinated wheat, de-husked sunflower seeds, papaya or apple, and carrot, to which were added calcium and vitamins. A female raised at Loro Parque was tame enough after six years to respond to whistles, eat from the hand and allow its head to be caressed, *contra* Murray (1969) who stated that this species is independent in character and indifferent to humans, and Low (1988, 1994a) who affirmed that hand-reared individuals show indifference to the person who takes care of them.

Population Management

Genetics

The captive breeding of *Triclaria malachitacea* must be planned so as to avoid endogamia (inbreeding), otherwise there will be a reduction in fertility and in the survival rate of the offspring, and an increase in susceptibility to illness. It is important that pairs are formed using individuals selected from widest possible gene pool. A centralised studbook must be created and exchanges between collections controlled by a studbook coordinator. The genetic lines of each individual should be determined using DNA analysis.

Demography

To increase the size of the captive population is fundamental to assure the continuity of the population without the necessity to capture further birds from the wild. It is also an important security measure should possible mutations, epidemics or other disasters put the captive population in danger.

Conservation

In Situ

According to Bertagnolio (1981) and Collar et al. (1992) the decline of this species has been brought about by hunting, land clearance for farming and the intensive collection of *Euterpe edulis* (Palmito), which some consider to be its main food plant. (According to Bertagnolio (1981) the Purple-bellied Parrot is particularly fond of the small fruits of the 'Palmito', a type

of palm growing in dense forest. The fibrous pith of this palm yields a starchy substance used mainly as a thickening agent in soups and puddings, and is extensively collected by cutting down the mature trees.) Bencke (1996) considers that in Rio Grande do Sul the cutting of wood for the curing of tobacco is the main threat and not the gathering of Palmito. According to Rumboll (1990), on São Paulo's south coast 85% of its habitat has been cut down. Straube and Scherer-Neto (1995) also cite this as the main cause of its decline in this area.

Studies indicate that the population is also decreasing because of increasing human activity and survives only in the most inaccessible areas and those for which humans have no use. This supposes their exclusion to isolated areas of forest where the opportunities for survival are not so great. According to Bencke (1996) one of the measures required is to create protected forest corridors linking these 'islands'.

According to Bencke (1996), the capture of individuals for the bird market is not significant in the state of Rio Grande do Sul, but according to Straube and Scherer-Neto (1995) it is significant on São Paulo's south coast. The commercial exploitation of wild individuals must be avoided because of the risk this poses to the wild population. A complete census of the wild population is recommended, along with a more complete study of its biology. This will determine with greater precision the population's status and the appropriate measures necessary for the protection of this species.

Ex Situ

To assure the survival of this species in captivity by achieving self-sustaining populations, collections in possession of this species must undertake responsible planning for its breeding. It will also be necessary to take into account the possibility of the need for captive bred birds to be released into the wild, therefore hand-rearing should be undertaken only when absolutely necessary. The results of investigations in to the biology of this species must be made widely available so that the best use can be made of the information.

Conclusion

As is shown in this work, there is still much to be learnt about the biology of this species. Larger and more complete studies need to be carried out to accurately determine the situation regarding *Triclaria malachitacea* in its natural habitat and to determine what conservation measures are required.

In aviculture, although it has been known for many years, it continues to be a difficult species to maintain and persuade to breed. A combined effort by the collections that possess this species, which includes an international breeding programme, would be an important step forward in obtaining better breeding results and thereby increasing the captive population.

APPENDIX

Loro Parque base formula for daily preparation of fresh diet, and cake and calcium block.

Mix 1			
Foodstuff	Amount	Foodstuff	Amount
Apple	40kg	Orange	15kg
Pumpkin	Seasonal	Carrot	20kg
Guava	Seasonal	Pear	12kg
Sea Beet [†] /Lettuce	5kg	Watercress	5kg
Spinach	5kg	Beetroot (boiled 1hr)	8kg
Prickly Pear	20kg	Banana	Seasonal
Pepper	18kg	Date	Seasonal
Millet	2kg	Bird Seed	2kg
Oats	2kg	Seed Mix [‡]	2kg
[†] Sea Beet <i>Beta vulgaris</i> var. <i>cycla</i> L.			

Mix 2			
Foodstuff	Amount	Foodstuff	Amount
Beans (boiled 1hr)	18kg	Sunflower (de-husked)	5kg
Corn (boiled 3-4 min)	20kg	Lentils (boiled 15 min)	18kg
Millet	2kg	Bird Seed	2kg
Oats	2kg	Seed Mix [‡]	2kg
[‡] Commercial mix that includes 11 different seeds			

Cake [‡]			
Foodstuff	Amount	Foodstuff	Amount
Wheat Flour	8kg	Soya Flour	2 kg
Grated Carrot	4kg	Cooked Beef	3 kg
Eggs	48	Calcium	30g
Baking Powder	300g	Water	8-10 litres
[‡] Baked 150°C (334°F) for 1hr 45min			

Calcium Block			
Substance	Amount	Substance	Amount
Milled Oyster Shell	1kg	Calcium Carbonate	2kg
Charcoal	0.5g	Rock Salt	250g
Red Clay	1kg	Milled Limestone	3kg
Milled Cuttlefish Bone	250g	White Cement	1kg

Products mentioned in the text

Carbonate Calcic: calcic supplement manufactured by Carmisur, S.L., Ctra. de Estepa s/n, Gilena, Seville, Spain.

Nutribird Pellets P19 and G18: formulated pellets manufactured by Versele-Laga n.v., Kapellestraat 70, B-9800 Deinze, Belgium.

Pet Chef Professional Breeder Supplement: Vitamin-mineral supplement manufactured by Pet Chef Ltd., Blean Park, 12 Honey Hill, Blean, Canterbury, Kent CT2 9JP, England.

Wilde Zaden: mixture of seeds marketed by N.V. Dufky S.A., Aziestraat 1, 900 Gent, Belgium.

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THE SOCIETY'S VISITS TO LEEDS CASTLE AND PAULTONS PARK

by Stewart Pyper

Leeds Castle, of which the bird collection is just one part, is probably the largest tourist attraction in Kent. During the 1960s and 1970s until her death, Lady Baillie maintained a varied collection there with the nucleus consisting of Australian parrakeets, which at the time were eagerly sought after by breeders both here and on the continent. Reports of her breedings were a regular feature in *News & Views*.

The Society first visited the bird collection in 1988, the year after the new aviaries were opened by H.R.H. Princess Alexandra. On Saturday, September 19th 1998, the Society made a return visit on what turned out to be a glorious and highly successful late summer day. Laura Gardner, the Curator, helped with the arrangements and together with her staff gave us a conducted and highly informative tour of the bird collection. Those present had a most enjoyable day spent in delightful surroundings.

Generally constructed from stainless steel, several of the aviaries have pointed roofs not unlike those of Kentish oast houses (used to dry the hops used in brewing beer) and these are used by the birds to shelter from the elements, although in all aviaries the birds have access to indoor shelters. All aviaries with the exception of those housing parrots are well planted and in some cases this led to difficulty viewing the occupants, but I understand that a certain amount of pruning was planned. However, the planting does provide excellent cover for nesting birds.

Those bred during 1998 included Red-billed Blue Magpies, Yellow-throated Laughing Thrushes, Kookaburras, Crowned Hornbills and second generation Von der Decken's Hornbills. It was the second year that Crowned Hornbills have been bred there. The first breeding you may recall was the subject of an illustrated report early in 1998 (*Avicultural Magazine*, 104, 2:61-64).

We saw Emerald and Royal or Golden-breasted Starlings, Roulroul Partridges and various touracos including the Purple-crested and Red-crested species. To try to stimulate the Toco Toucans to breed cork is fixed over the nest-box entrance hole and the birds have to chip this away as if they are excavating a nest hole in a tree in the wild. Because both Blue-bellied Rollers are believed to be females, they had been separated. We also saw a partly grown Crowned Crane with its parents and Demoiselle Cranes in an open paddock with a water feature housing Koi carp and Hooded Mergansers.

The varied selection of parrots range from Goldie's Lorikeets to Splendid Grass Parrakeets, Roseate and Blue-eyed Cockatoos, Australian King

Parrakeets, Green-winged and Scarlet Macaws and Tucuman Amazons. We were shown where the food is prepared off-exhibit and in the rearing room saw three Tucuman Amazons only two to three weeks old, seven Red-fronted Kakarikis, two Royal or Golden-breasted Starlings, two Red-crested Touracos and two melanistic Stella's Lories. The last four were housed in small, suspended flights, which make cleaning so much easier. A great variety of commercially produced livefood is available to help with successful rearing.

It was pleasing to see displayed on an information board the Avicultural Society first breeding certificates awarded to the Leeds Castle collection for the first breeding of Fischer's Touraco and Von der Decken's Hornbill. The certificate for the first breeding of the Crowned Hornbill can now be added to the earlier two. It is excellent publicity for the Society.

Earlier in the year the Society visited Paultons Park, Ower, Romsey, Hampshire. Arrangements for the visit were handled by Geoff Massom, the General Manager, who is a member of our Society. Many of us had not visited the park before and we were all impressed by the excellent aviaries, their occupants and the general lay-out of the collection, with plenty of room still for expansion.

There is a wide selection of birds housed in aviaries which vary in size according to the requirements of the occupants. The aviaries are mainly in blocks spread around the grounds. There is a varied selection of hornbills including Rhinoceros, Wrinkled, Trumpeter and Von der Decken's. The successful partial hand-rearing of a Wrinkled Hornbill at Paultons Park was the subject of an article in the *Avicultural Magazine* (103,4:163-169). Toco and Sulphur-breasted Toucans are housed in the flights adjoining those of the hornbills. Separate aviaries house Kookaburras, White-cheeked and Violaceous Touracos. There are selections of seedeaters from the continents of Australia, Asia and Africa in three glass-fronted flights.

Violet-backed and Emerald Starlings, Roulroul Partridges and Zosterops were among the birds on view in the small tropical house. The park has a varied selection of parrots including a prolific pair of Green-winged Macaws. A selection of pheasants and guans share their flights with various doves, thrushes, bulbuls and starlings. A pair of Red-legged Seriema in an enclosure close to some houses were proving to be very vocal, especially early in the mornings.

BOOK REVIEW

INTERNATIONAL ZOO YEARBOOK

Although the emphasis in the first section of the *International Zoo Yearbook*, Volume 36, is concerned with various aspects of the management of Old World primates, there is much within its 663 pages of interest to those who keep or work with birds. Major articles include Hand-rearing the Eastern or Great White Pelican (Vogelpark Avifauna), Breeding and rearing the Oriental White Stork (Shanghai Zoological Gardens), Individual variation in food consumption and food preferences in St Lucia Parrots (Jersey Wildlife Preservation Trust) and Breeding the Red and Blue Lory (Loro Parque).

There is also a comprehensive reference section which, with a few exceptions such as China, provides concise but informative details of the world's zoological collections and aquariums. A valuable census of rare animals in captivity covers, in this volume, the years 1996-1997. As Malcolm Ellis, Editor of the *Avicultural Magazine* remarked in a recent conversation: 'If it was not for the *International Zoo Yearbook* we wouldn't know half of what is being kept and bred in collections around the world'. Many species take the eye in this particular section, including Madagascar Teal (Jersey, Channel Islands), Hoatzin (New York, USA), White-necked Picathartes (San Antonio, USA), Grey-necked Picathartes (Frankfurt, Germany) and Brown Sicklebill (New York, USA).

The list of birds bred in collections makes encouraging reading for the many people who believe that captive breeding programmes make a meaningful contribution to the conservation of an increasing number of species. It is interesting to see a growing number of 'difficult' species breeding successfully. Almost inevitably my eyes strayed to some of the smaller species - and not just Passerines for there have been some significant achievements among other Orders, which will add to existing knowledge of the species concerned. Among them are Elf Owl (Tulsa, USA), White-tailed Trogon (Walsrode, Germany) and Crimson-breasted Barbet (San Diego, USA). Prominent among the Passerines are Spangled Cotinga, Bare-throated Bellbird, Vermilion Flycatcher and Barn Swallow (Wuppertal, Germany), Brown-throated Wattle-Eye (Arnhem, Netherlands) and Red-billed Oxpecker (Dresden, Germany). Six species of birds of paradise, 21 tanagers, 11 barbets and nine toucans are also listed from other collections.

The *International Zoo Yearbook* is edited by P.S.J. Olney and Fiona A. Fiskien, while Linda J. Davolls is Assistant Editor. It is published by the Zoological Society of London, Regent's Park, London, NW1 4RY. Volume 36 costs £65.00 (plus postage and packing).

Frank Woolham

NEWS & VIEWS

STORMY END TO POSSIBLE FIRST BREEDINGS

Torrential rain and gale force winds in the coastal province of KwaZulu-Natal, South Africa, put an end to the possible first aviary breedings there of Vieillot's Black Weaver *Ploceus nigerrimus* and a race of the Village or Black-headed Weaver *P. cucullatus paroptus*. According to Neville Brickell of the Avicultural Research Unit, the birds belonging to Trevor Konigkramer are housed in an aviary 10.5m long x 5m wide x 3m high (approx. 34ft 3in long x 16ft 3in wide x 9ft 5in high). The first nest was attached to a dry branch and contained three pale bluish white eggs with large brown spots at the broad end. One of the eggs was measured and found to be 20mm x 14mm. The nest of *P. c. paroptus* was attached to the wire mesh of the aviary roof and also contained three eggs. These were greenish blue and one of them measured 24mm x 17mm.

* * *

BOOST FOR THE BLACK PARROT

According to a report in *The Times* newspaper, the British Foreign Office is to spend £15,000 (approx. US\$24,000) from its environment fund on a conservation project aimed at boosting the number of Black Parrots *Coracopsis nigra barklyi* on the island of Praslin, in the Seychelles. This race is confined to Praslin Island on which only about 200 are thought to survive. The money will be used to provide 60 nest-boxes, supported on tall platforms and mounted on metal poles. The boxes will be screened with palm leaves and have, according to the report, the desired drop from the hole down to the nesting chamber, similar to that of its natural nest site in the hollow trunks of Coco de Mer or Latanier Palms.

* * *

RUDDY CONTROVERSY

The UK Environment Minister, Michael Meacher, has given the go ahead for thousands of Ruddy Duck *Oxyura jamaicensis* to be shot during the next three years as part of a trail project to assess whether this species can be eradicated from the British Isles. Many groups and individuals, including I know, our member Derek Goodwin, are strongly opposed to the cull, but the RSPB (Royal Society for the Protection of Birds) believes it is necessary to try to help save the rare White-headed Duck *O. leucocephala* with which, in Spain, the male Ruddy Duck hybridizes so readily. The first Ruddy Ducks escaped in the early 1950s from what was then called the Wildfowl Trust, at Slimbridge, Glos., and the species has bred very successfully in Britain and has now spread to some 20 other countries, including, Spain.

THREE RED FACES

John Harvey, of Devizes, Wiltshire, reports that during 1998 he succeeded in breeding five Indian Silverbills *Lonchura malabarica*, a Blue-breasted Waxbill *Uraeginthus angolensis* and three Red-faced Pytilias *Pytilia hypogrammica*. The silverbills used a traditional nest basket in which they raised broods of two and three young. The Blue-breasted Waxbills had numerous nests in which the young died within the first 12 days and succeeded in raising only one youngster to independence. The pair of Red-faced Pytilias consisted of a male which John bred in 1997 and a female he purchased in September of the same year. Altogether they had three nests, all with fertile eggs, but only one nest of three eggs all hatched and all three young survived. This was in July during one of the warmer periods of the summer. They were fed the usual seed mixture given to such birds, plus mini mealworms and were provided with a fruit fly culture and could also catch livefood in the outside flight. John was unable to obtain ants' eggs last year, which he believes are a valuable form of livefood when Estrildids are rearing young.

* * *

EXOTIC ESCAPEES

According to an account in *Winging It*, Newsletter of the American Birding Association, Inc., Vol.10, No.11, 177 species of exotic birds have been reported in Florida, probably more than in any other state in the USA. One of the latest is the Purple Gallinule (or Swampheh) *Porphyrio porphyrio*. Eighty-four have been counted 15 miles (approx. 24km) south-west of Fort Lauderdale. They appear to be of the pale-headed race *P. porphyrio poliocephalus* and are breeding there. They are thought to originate from Miami MetroZoo's Wings of Asia exhibit, from which some escaped in 1992 when their aviary was destroyed by Hurricane Andrew.

* * *

OVER TWENTY THOUSAND BOOKS

The Horniman Library contains over 20,000 books, current journals and audio-visual material on Ethnography, Musical Instruments and Natural History (including many bird books). The library is open to the public for reference use, without appointment: Tue - Sat 10.30am-5.30pm and Sun 2.00pm- 5.30pm. It is closed Mondays and Bank Holidays.

It is part of The Horniman Museum and Gardens, 100 London Road, London SE23 3PQ. Tel: 0181 699 1872/Fax:0181 291 5506/E-mail: enquiry@horniman.demon.co.uk.

LESSER SUCCESS

A Lesser Flamingo *Phoeniconaias minor* has been bred at Hillside Bird Oasis at Mobberley, Cheshire, which is co-owned by Diana Holloway (recently elected an Avicultural Society Council Member) and Mark Rubery, who also own Blackbrook Zoological Park. The egg hatched after 28 days and the chick was brooded for the first three days by the female with the male often in close attendance. At five days old the chick was mobile and easily able to climb back on to the nest mound. It is the fourth kind of flamingo to breed there, the others being the Caribbean *Phoenicopterus ruber ruber*, Greater *P. ruber roseus* and Chilean *P. chilensis*.

* * *

UTTERLY DISGUSTED

One of a group of American tourists visiting St James's Park in London, was said to have been 'utterly disgusted' by the sight of a pelican catching and eating a Moorhen *Gallinula chloropus*. The offender was one of two American White Pelicans *Pelecanus erythrorhynchos* and two of the African species *P. onocrotalus* living on the lake in the park. Pelicans are said to have first been kept in St James's Park in the 1660s, when the Russian Ambassador presented a pair to Charles II. At least 40 pelicans have been kept in the park this century.

* * *

FIFTY-ONE YEARS OLD

Phil Digney, Supervisor of Birds at Adelaide Zoo, reports in *Bird Keeping in Australia*, Vol.42, No.6, that from seven pairs of Nicobar Pigeons *Caloenas nicobarica*, six young have been fledged this year and another egg is still being incubated. Other recent hatchings have included three Brush Bronzewing Pigeons *Phaps elegans*, two Squatter Pigeons *Geophaps scripta*, two Pied Stilts *Himantopus himantopus leucocephalus*, six Rainbow Lorikeets *Trichoglossus haematodus*, two Yellow-tailed Black Cockatoos *Calyptorhynchus funerus*, 16 Gouldian Finches *Chloebia gouldiae*, eight Bleeding Heart Doves *Gallicolumba luzonica*, three Shining Starlings *Aplonis metallica*, one Red Lory *Eos bornea* and two Rose-crowned Fruit Doves *Ptilinopus regina*. The zoo's Chilean Flamingo *Phoenicopterus chilensis* is now 51 years old. Its sight has been declining for some time and it now appears to be blind in one eye.

* * *

VETS IN THE JUNGLE

The Caribbean Veterinary Medical Association recently held its 21st Biennial Congress in Guyana, South America. The papers included one on the spread of ticks by birds and specifically whether Cattle Egrets *Bubulcus ibis* can be hosts to immature stages of *Amblyomma* and might carry these as far as southern Florida, USA.

At the conclusion of the congress some of the delegates, including Margaret and John Cooper from the UK, spent two days at the Shanklands rainforest resort on the edge of the Essequibo River. They found it a tranquil and picturesque spot with ready access to the 'jungle' and where one can readily appreciate tropical biodiversity. Margaret and John saw and heard many species of birds including toucans, macaws and vultures. They were astonished that birds as large and brightly coloured as macaws remain so well hidden that they at first needed a guide to point them out. Only the sound of falling fruits and a faint red haze in the canopy gave away their presence. Margaret and John also saw plenty of guans skulking in the undergrowth. Both the open, grassed areas and the forest abound with insect life, especially butterflies such as the vividly coloured heliconids that are so popular in walk-through insect houses in European zoos and the breathtakingly beautiful *Morpho* species, with iridescent blue wings. Anole lizards clamber among the bushes and large tegus run through the grass. Mammals were elusive and not easily seen but were nevertheless abundant and ranged from insectivorous and frugivorous bats to agoutis and White-faced Saki Monkeys.

The arrival at Shanklands of so many vets soon prompted the request: 'Will you look at our eagle?' and the group found themselves examining a magnificent Harpy Eagle *Harpia harpyja* that had been brought in, as a casualty, some months earlier. It provided a superb opportunity for a demonstration of avian diagnostic techniques and for the Caribbean vets to gain experience of handling and examining a large and immensely powerful raptor. Later, a similar examination was carried out on a macaw with suspected nerve damage.

A larger proportion of primary forest remains in Guyana than in any other South American country and this is home to many rare and important birds and other animals. It is well worth a visit and any aviculturist or ornithologist can be assured of a warm welcome and lots of birds to see!

* * *

AUTUMN SOCIAL MEETING

On Sunday September 19th, members and their guests have been invited to visit Will Harrison's collection at Wem, Shropshire. Fuller details and a booking form are included with this issue of the magazine.

The Avicultural Society

FOR THE STUDY OF BRITISH AND FOREIGN BIRDS
IN FREEDOM AND CAPTIVITY

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EDWARD R. FITZSIMMONS 1921-1999

To all of us who knew him, Ed FitzSimmons was one of those larger than life, unforgettable characters one usually only reads about in books and magazines. Born and raised in China, where his father worked for Mobil Oil, Ed gained his love of birds early in life watching the elders in his village work with Chinese pigeons, learning from them how to sew the carefully fashioned fluted gourds into their tails in order to fly the 'aerial orchestra' on special holidays. Years later, at his ranch in Healdsburg, California, we would sit around and listen to his tales of China as we sewed these fluted gourds into the tails of his own Chinese pigeons and I could just imagine how this whole process would have fascinated that five year old boy.

I first met Ed in the early 1970s at one of many memorable soirées during that decade hosted by Ken Searle, Harry Horswell and Raymond Sawyer. Avid bird collectors all, these were the men who - along with Fred Johnson, Alfredo Marques, Philip Wayre and others, were following in the footsteps of such legends as Jean Delacour, Lord Chaplin and Alfred Ezra - to protect and breed so many endangered species of birds. I was working for John J. Yealland, Curator of Birds at the Zoological Society of London at that time and in later years have often marvelled at how incredibly fortunate I was to have worked alongside such singular and unique individuals. Those were, indeed, heady days.

I later moved to California to work with Ed's bird collection. He was in partnership with Vern Denton of Livermore, whose expertise with pheasants was widely known. Pooling their resources, Ed and Vern had gathered an amazing collection of rare pheasants and parrakeets and were successfully breeding most of the species they kept. Tragopans, Argus, Impeyan, Blood and peacock pheasants: many first breedings came from this collection. After meeting Alfredo Marques, Ed's interest in unusual coloured parrakeets was kindled and I travelled to such diverse places as Belgium and Calcutta attempting to match up pairs of blue Quakers and lutino Ringnecks.

Being a man of varied interests and passions, Ed was a true collector: birds, Chinese jade and pottery, avicultural books, Arabian horses and most of all, friends. His generosity and many kindnesses were legendary. His intellectual curiosity, bright wit and indomitable spirit will be sadly missed but he would love the fact that so many of us will be telling Ed FitzSimmons stories for many years to come.

Jane Camp

BETTY RISDON

Betty Risdon, who with her late husband Don, founded Rode Tropical Bird Gardens, died May 18th, aged 81. Betty was elected a Vice President of the Avicultural Society in 1996. Reviews of her books, *The Road to Rode* and *The Roads from Rode*, were published in the previous issue of the magazine.

ASSESSMENT OF IRON STORAGE IN RAMPHASTIDS

Sponsored by Chester Zoo & University of Bristol

Bristol Vet School is launching a new project which will assess the problem of iron storage disease in the UK's captive population of toucans and related species.

This study will be undertaken on a national level and will examine (free of charge) submissions from avian vets, zoos, bird gardens and private aviculturists. Complimentary reports will be forwarded to the referring veterinarians and will include a qualitative and quantitative assessment of each patient's iron storage status plus any additional histopathology findings.

Preliminary investigations suggest that iron storage occurs in clinically normal ramphastids. In order to ascertain the extent of this problem, it is therefore important to examine all birds regardless of the cause of death. Please consider sending samples from any ramphastid post mortems with which you may be involved. Biopsy submissions from active clinical cases will also be accepted.

Further information is available from:- Adrian Fowler, Project Co-ordinator, Toucan Project, Department of Pathology & Microbiology, Comparative Pathology Laboratory, School of Veterinary Science, Langford, Bristol BS18 7DU. Project Co-ordinator: 07666 818525 (Direct Paging Service)

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AVICULTURAL MAGAZINE



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THE AVICULTURAL SOCIETY

The Avicultural Society was founded in 1894 for the study of British and foreign birds in freedom and captivity. The Society is international in character, having members throughout the world.

Membership subscription rates per annum for 1999 as for 1998: British Isles £18.00; Overseas £21.00 (plus £6.00 for airmail). (U.K. funds please). The subscription is due on **1st January of each year** and those joining the Society later in the year will receive back numbers of the current volume of the AVICULTURAL MAGAZINE.

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ADDRESS OF THE EDITOR

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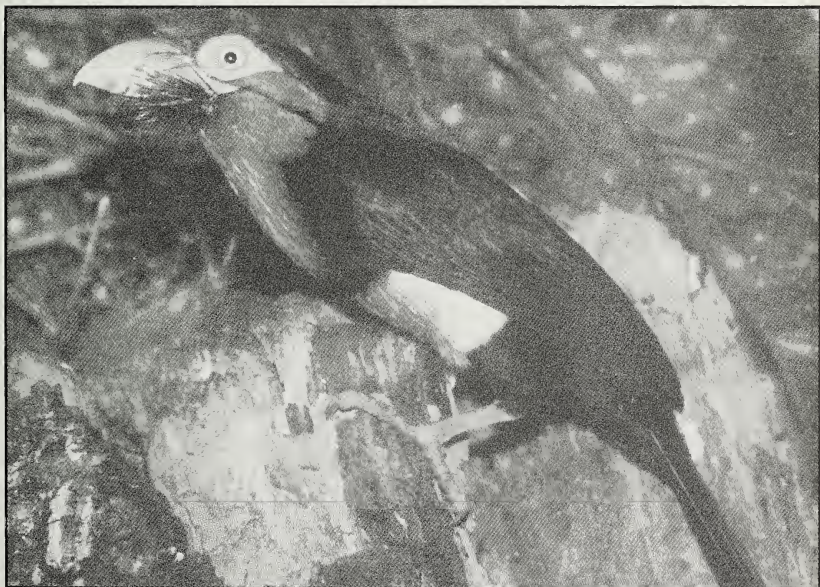
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BREEDING THE BEARDED BARBET

by Eric Callaghan

The Bearded Barbet *Lybius dubius* is native to West and Central Africa, where it is to be found in tall trees at the edges of open woodlands, wooded grasslands and cultivation, in clearings in woodlands, and in small isolated forest patches or clumps of second growth on old plantations (Fry et al. 1988). It is a large barbet, basically black and red in colour, with the mid- to lower-back white. The flanks are creamy white. It has a large, grooved yellow bill, with two 'teeth' each side, and the bare skin around the eyes is also yellow.

Four of these birds were offered for sale in July 1997. They were in good feather, although a little rough, as softbills often tend to be in dealers' hands and one bird had a badly dropped wing and seemed unable to fly.



Bearded Barbet female showing spots on flank

Eric Callaghan

However, it managed to get about the flight by climbing up the wire. One bird seemed to be slightly larger than the rest and, while all four would flick their tails from side to side while being watched this was the only one to vocalise, producing a loud 'caw'. At the time I had no information concerning the sexing of the birds, so I obtained all four, suspecting there was at least one male in the group. Later I discovered that the female can be distinguished from the male by the presence of black spots on the flanks (Fry et al. 1988). It was possible to see these spots without catching the birds and this confirmed that I had one male and three females, the male being the slightly larger bird, as I suspected.

After a few days in a large cage, the four birds were placed in an aviary measuring 8ft deep x 5ft wide x 6ft high (approx. 2.4m deep x 1.5m wide x 1.8m high). This is one of a series of flights having the rear and one side enclosed as is the rear half of the roof. Therefore the birds were only exposed at the front. There was some dry heather hanging at the back of the aviary, left from the previous occupants, a flowering currant bush was growing along the open side and there was a large abutilon bush near the front trimmed back to just below the roof. Before the birds were put into the aviary a block of rotten birch measuring 1ft 8in wide x 2ft high (approx. 51cm wide x 61cm high), but only 8in (approx. 20cm) deep, and a wooden nest-box 2ft 6in high and 6in square (approx. 76cm high x 15cm square) were hung along the covered side. From the first night all four birds roosted together in the box. There was a feeding tray near the front of the aviary and a water dish was placed on a pine log approximately 3ft (91.5cm) high.

Feeding

The birds are fed on a mixture of chopped fruits. Initially the fruit was mixed with a commercial softfood, but the birds were reluctant to take this and later the fruit was coated with a dry baby cereal. Softfood was offered in a dish and usually was only eaten when all the fruit had been consumed. Fruits offered were banana, apple, pear, tomato, grapes, kiwi fruit, melon, peach, plum and occasionally tinned fruits. All fruits were chopped to a size suitable for swallowing whole and all were consumed, although apple and banana were the least favoured. Occasionally chopped orange was added to the mixture and was readily eaten. Blackberries, elderberries and raspberries were always refused. Later, I found that a pomegranate, cut in half and wired into place, would also be eaten. Livefood, mainly in the form of mealworms, was eaten readily, but later on very little interest was shown in it until the birds began to breed. On this diet the birds have retained their red colour perfectly without the aid of artificial colour-feeding.

In his account of breeding the related Double-toothed Barbet *Lybius bidentatus*, Derrick England said that he found his birds to have marked preference phases, often selecting one type of fruit only. He also found that

there were days when his birds did not eat at all (England, 1976). My birds have never behaved in this way.

1997

The birds' plumage greatly improved after a couple of weeks in the aviary and gradually the bird with the dropped wing recovered to the extent that it could fly again and the wing is now only very slightly displaced. Unfortunately the birds are not ringed, making it difficult to distinguish individuals, especially from a distance. This has restricted the amount of detailed behavioural information that has been obtained.

After a week or so in the aviary the birds began to excavate a hole in the section of birch. This progressed rapidly and in a very short time they had bored right through the block. The birds have always remained nervous of being watched and I never could determine how many birds were involved in the excavation. I installed a section of pine log but this proved too hard for the birds and while some of the bark was removed, no further progress was possible. I then managed to locate a section of rotten birch. This was about 3ft (91.5cm) high and 1ft 4in (40.5cm) in diameter. It was placed on the pine log at the front of the aviary in such a way that the top was about 6in (15cm) below the aviary roof. For a week the birch appeared to be ignored and then one morning I found that a hole had been started about 6in (15cm) from the top of the log. Fortunately this was on the side of the log facing across the aviary front and so could easily be observed. By the same afternoon progress was such that I could see just the tip of the tail of an excavating bird. The bird backed out with a beakful of wood chippings that it dropped from a perch half-way down the aviary. This was the only time I caught a bird in the act of excavation.

As the birds were recently imported, my intention was to remove them from the aviary at the first sign of discomfort as the weather deteriorated, but in the event the winter of 1997-1998 turned out to be mild and there was never any need to take the birds indoors. The fact that all four slept together in the birch log was a definite advantage.

1998

The barbets came through the winter in fine condition and the first indication of any change was on April 26th 1998, when I heard a different sound coming from the aviary. At the time I noted this as a slow, 'chop, chop' sound repeated many times. As the birds were so wary I could not determine which bird was making the call for as soon as they saw me they moved to the back of the aviary. By the second week in May I only ever saw three birds in the aviary at one time, so it seemed that they might be nesting. Unfortunately, it was not possible to know whether it was always the same bird that was missing.

On May 19th a broken white egg was found on the aviary floor, suggesting that it may have been laid from a perch. This later disappeared, presumably eaten by the birds. The next day I put a pot of mealworms into the aviary and stayed to watch. The male repeatedly collected one or two mealworms at a time and fed them to one of the females that simply sat on a perch and waited for him to bring them to her. The mealworms were always swallowed and regurgitated to the female. A second female was in the nest throughout this, while the female with the dropped wing took no part in the proceedings. Nothing resulted from this nesting attempt although one or other of the birds continued to spend long periods in the log. It was very frustrating not being able to see what was going on inside or to know which individuals were spending time in the log.

The first indication of success was on August 21st when a deep croaking was heard from inside the log. Initially I thought this indicated a large nestling, but later I heard the sound from one of the adults in the aviary. By mid-day the fruit dish was empty, as was the dish of softfood, which was most unusual. Fresh fruit was supplied, together with a dish of mealworms and immediately three of the four birds began to take beakfuls of mealworms to the nest. The birds worked in relays, each waiting its turn at the entrance to the nest. This was the only time I saw them carry mealworms in the bill and they dropped many in the process. I could not determine which bird was not participating in the feeding. It seemed certain that at last they had young. Livefood consumption was never very high and I supplied about a tablespoonful of mealworms three times daily. In addition, I offered waxworms, half-grown locusts and thawed, frozen crickets. They only displayed interest in the latter, but these were taken only when mixed with the mealworms. There is no doubt that the nestling was fed fruit from a very early stage. The birds would not visit the nest if I was nearby and I could only watch what was happening by remaining hidden behind a bush about 15ft (approx. 4.5m) from the aviary, so it was not possible to record many details.

It was September 1st before all four birds were seen together in the aviary and from then on much less time was spent in the log. On September 17th I managed to reach the aviary just after an adult had entered the log and I could hear faint 'mu-mu-mu-mu' sounds coming from the nest. On September 19th a young barbet was seen looking out of the nest entrance for the first time. It was not overly shy and did not withdraw very quickly, enabling me to see that the red on the throat was every bit as brilliant as that of the adults. The bill was considerably smaller and there was no sign of the 'teeth'. The adults did not appear to feed the chick at the entrance and would wait for it to descend to the nest chamber before entering to feed it. On September 24th I found that the adults had opened a second hole to the nest, apparently a little above the floor of the cavity. This revealed that the nest log had been

excavated to a depth of at least 18in (46cm). The chick spent the next couple of days looking out of this hole. Each time I approached the aviary the adults uttered a loud 'carr' sound, presumably a warning call which was ignored by the chick, which continued to stare at me!

The young barbet fledged on the morning of September 26th. In colour it was every bit as bright as the adult but there was a slightly greater area of black on the sides of the breast. The eyes were dark, in contrast to the yellow of the adults' and the bird was about three-quarters the size of the adults. The beard was much less well developed than in the adults. The beak was the same colour and about two-thirds the size of the adults' and, as already noted, there was no sign of the 'teeth'. This is in contrast to the description of the immature given in Fry et al. (op. cit.) where the immature is described as being 'like adult but black and red duller, breast dull black, throat red mixed with black, base of bill dusky'. The fledgling returned to the log that evening. From this point on it was out of the nest every day, I never saw the adults feed it, but then they had become even more wary at this stage. Once the young bird had fledged I could see that the flanks were unspotted suggesting that perhaps it could be sexed as a male at this early stage. The young bird was reared successfully and has remained with the group without any problems. This contrasts with the situation at St. Louis Zoo, where it was found that the male was inclined to attack the young on fledging (Tim Snyder, St. Louis Zoo, per. comm.).

During the winter of 1998-1999 the barbets bored a number of holes in the nesting log at various levels. At the time of writing (March 1999), they are again showing interest in spending time in the log. This is similar to the situation at St. Louis Zoo, where the birds continued to re-use the same log, in spite of having added more holes (Tim Snyder pers. comm.). Even now, with the renewed interest in nesting, the young barbet remains fully integrated in the group.

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As described above, the Bearded Barbet *Lybius dubius*, has been bred by Eric Callaghan. This is probably the first successful breeding of this species in Great Britain or Ireland. Anyone who knows of a previous breeding is asked to inform the Hon. Secretary.

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A TRIP TO SEE THE BALI STARLING

by John Horton

During the middle two weeks of June this summer I visited the Indonesian island of Bali. An obvious priority was to attempt to see the Bali Starling *Leucopsar rothschildi* in the wild. Currently the only refuge for the birds is the Bali Barat National Park (*Taman Nasional Bali Barat*) which is located on the north-west of the island. It incorporates the whole of west Bali's mountain range covering 760sq km (approx. 290sq miles), 90% of which is out-of-bounds to visitors. Within the park's perimeter about 160 species of birds have been seen, these include a number of Indonesian endemics and otherwise scarce or difficult to see species.

The Bali Starling or Rothschild's Myna (*jalak putih Bali* in Bahasa Indonesian) is considered never to have been common on the island, even though in the 1920s naturalists reported seeing 'hundreds of birds'. In 1966 the species was put on the endangered list and by the mid-1980s excessive trapping for the pet trade had reduced the number in the wild to about 150. The total had dropped to 14 by 1998. The current situation will be discussed further later in this account.

Bali has a thriving cage bird trade and as one travels around the island it is clear that almost every dwelling has at least one bird in a small Victorian-style cage. Bird sellers are numerous and there are a number of bird markets. I did not visit these, as having seen similar markets elsewhere in south-east Asia, I knew that the conditions under which the birds were being kept would be somewhat dire with numerous unsuitable species being offered for sale. It is little wonder the Bali Starling has suffered such a rapid decline, as apparently they fetch well in excess of \$1,000 each on the black market.

Surprisingly the national park is not advertised locally and does not appear on any hotel excursion list. The vast majority of tourist accommodation is in the south and east of the island. I stayed at a hotel about 10km (approx. 6 miles) north of the resort of Kuta and by hire car it was a four hour drive to the park headquarters at Cecik, a short distance from Gilmanuk where you can take the 30 minute ferry ride to Java. Everything on Bali is haggled over, even hotel rates, and a sturdy Jeep (a *Kijang*) eventually cost the equivalent of £6 (approx. US\$10) per day. There are several cheap small hotels at Gilmanuk, hence it is not a problem finding accommodation. At the park headquarters there are chalets which can be rented, but on my visit they had lost the keys and after some searching I was directed up the road!

In order to go anywhere in the park it is compulsory to hire a guide. My previous experience of such guides was that they range from superb to

virtually useless and when my guide, Yudi, was presented things looked ominous, as he spoke little English and had no binoculars. As it turned out he had sharp eyes when it came to spotting things and knew reliable sites for Green Junglefowl *Gallus varius* and Rufous-backed Kingfisher *Ceyx rufidorsus*. I used one of the many birding guides during my trip and though it was generally accurate, it was clear that as the national park has become more organised, prices have risen sharply. Fees for guides and park entry are fixed and you are handed a price list for various excursions. In the previous 10 months the set price of a guide for three hours had risen from the equivalent of £1.25 (approx. US\$2.00) to £7 (approx. US\$11.20), with trips to the Bali Starling release site having risen from £8 a person to over £100 (from approx. US\$12.80 to US\$160), and prices are set to rise again for the Millennium.

Unaware of this colossal inflation, I did not have sufficient money with me to cover the cost of visiting the starling site. Fortunately though the Director of the park was present at the time and due to the combination of my employment at Jersey Zoo and the 'donation' to him of my field guide, I was eventually granted permission to make the trip as his official guest. I got the distinct impression they are not overly keen on anyone visiting the starlings, which may explain the rise in the cost, which in retrospect, can only be good for the birds. It should be pointed out that it is not possible to visit the Bali Starlings at all, if you have not first written to the Director requesting to do so and giving the proposed date of your visit. I had indeed done this but on my arrival found that the Director's staff had 'mislaidd' the correspondence, he had though read it and made a note about my forthcoming visit. Once the Director recognised that my interest and enthusiasm for his starling breeding project was genuine he was very happy to divulge the latest information which enables me to report that at the captive breeding centre at Sumber Kalmpock there were, at the time of my visit, 81 Bali Starlings. There were a further 10 captive birds at the pre-release site at Brumbun. The total number of Bali Starlings in the wild was 37.

The captive breeding centre at Sumber Kalmpock is situated within the park and is about 10 minutes from the headquarters. It is a small complex of aviaries in two blocks in a forest clearing. Each block has a central corridor with the birds' indoor quarters on either side. The adjacent aviaries have a complete bamboo surround to minimise human contact. I have seen cleaner facilities but could not fail to be impressed by the keeper's enthusiasm for his birds. Using pidgin English I managed to establish that almost all breeding pairs parent-rear their chicks but was also proudly shown a three week old hand-reared individual. The birds are fed local fruits, predominaté among them being papaya. They are also offered a commercial softbill pellet (soaked) that is imported from Jakarta, as well as red ant larvae and

caterpillars collected from the adjacent forest and mealworms bought from the local bird market. The adults are kept in pairs and two of the aviaries boasted groups of young birds. The rangers make rings for them from aluminium and keep a record of each bird.

The pre-release centre and the wild birds are at Brumbun on the Prapat Agung Peninsula, which is reached by driving to Labuan Lalang. According to the information in my birders' guide the starlings were to be seen on Deer Island (*Palau Menjangan*) but the Director told me that the small colony 'introduced' there has died out, leaving Brumbun the only site. From the park headquarters I was escorted by two rangers for the entire visit. The small boat from Labuan Lalang took about 45 minutes to reach Brumbun and landed on a small shingle beach, where we jumped ashore. One of three full-time rangers was waiting to meet us. Just ahead was the rangers' office and accommodation, 50m (approx. 165ft) from which is a huge aviary some 60ft (18m) high, the shape of a giant marquee, housing the pre-release birds. I was taken about 400m (approx. 440yd) up-hill to a watch tower from where there were superb views of the surrounding savannah forest and good birding, culminating in brief, distant views of two Bali Starlings. I was then led back down and along a track beside the sea for about 3km (almost 2 miles) to a spot where 12 birds, one of which was close ringed, were feeding in nearby trees, and felt privileged to witness such a superb spectacle. The Director of the park had confirmed earlier that released birds had successfully bred with existing wild birds for the first time in 1998, which is a real breakthrough. The next release birds are due to join the colony later this year.

The starlings have few natural predators. Chicks are occasionally lost to snakes and young monitor lizards and adults may apparently be taken sometimes by Crested Hawk Eagles *Spilornis cheela bido*, but this is rare. Although three years ago some Bali Starlings were illegally trapped, trapping has now been largely eradicated and heavy fines and jail sentences await would-be transgressors.

The Bali Forestry Department has received captive bred stock that originated from Jersey Zoo. Currently a bird park on Bali which is working closely with Vogelpark Walsrode in Germany, has begun its own Bali Starling Foundation and this contributes funds to the Forestry Commission. There is some confusion as to who is doing what for the Bali Starlings but it is evident that whilst the Balinese Forestry Department are making great efforts to save the species there are clearly good numbers in reserve in zoos, bird gardens and private collections, should their efforts falter.

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HAND-REARING A SUPERB FRUIT DOVE ***Ptilinopus superbus* AT LONDON ZOO**

by Paul Harrington, Amanda Ferguson and Patsy Joseph

Introduction

It is generally known in avicultural circles that hand-rearing Columbids from hatching is very difficult and has rarely been successfully achieved. During the early part of their development pigeons are reared entirely from crop milk - a curd-like substance secreted from the lining of the crop of the parent birds and fed to the chicks by regurgitation (Goodwin, 1983; Griminger, 1983). Baptista et al. (1997) contains a full discussion of Columbidae reproduction.

Pigeon crop milk has been shown to contain a growth promoter which enhances early rapid development. In the Superb Fruit Dove *Ptilinopus superbus* growth is particularly fast with a chick able to attain 25% of its adult body weight in as little as six days (Crome, 1975). However, the growth promoting factor has yet to be identified and so cannot be reproduced for use in an artificial crop milk. Development of a Superb Fruit Dove reared on an artificial rather than a natural crop milk could therefore potentially be retarded.

In February 1998 a Superb Fruit Dove was hand-reared from hatching at London Zoo. This followed the removal of an egg for artificial incubation, when it became clear that it was not being properly incubated by the parent birds.

Hand-Rearing

A hand-rearing diet to simulate a natural crop milk was formulated using Quark (a soft cheese product), Tofu (soya bean curd), hard-boiled egg, 0.9% saline solution, calcium lactate and SA37. The protein and fat percentages in the mix were 11% and 4% respectively. These were at the lower end of the scale for the known protein and fat levels in natural crop milk. It was thought that higher percentages of these two dietary components might lead to too viscous a mix which would reduce the motility of food through the crop. It was also thought that too high levels of these components might compromise liver function. Animal and vegetable proteins were used in the formula to cover the full spectrum of essential amino acids. Carbohydrate in the form of starches and sugars were close to zero which was in line with the levels found in natural crop milk. As the chick developed, other food items were added to the formula which increased the carbohydrate component of the diet (see Table 1).

The consistency of the mixture needed to be such that it was neither too liquefied, which could result in aspiration of food, or too thick which could result in crop stasis and impaction. The chick was fed using a syringe. The bottom of the syringe was enlarged to allow the chick to insert its beak and swallow the mix (Brown, 1995). To offer food from a syringe was considered a more passive feeding method, with less chance of accidental aspiration, than to feed using a spoon.



Young *P. superbus* at four days old showing full crop immediately after a feed

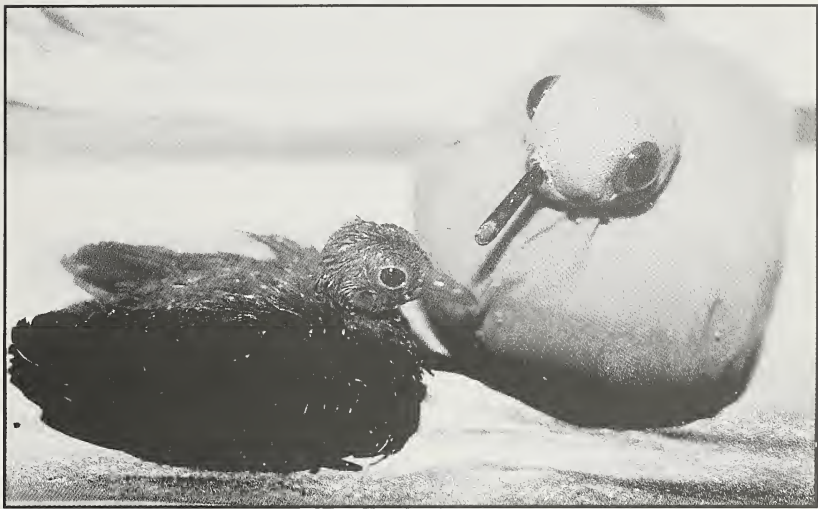
In the absence of the benefits derived from natural crop milk to promote rapid development in the chick it was considered essential, when hand-rearing with an artificial diet, to maximise the chick's food intake. This was achieved by:

1. Incorporating a high number of feeds. The number of feeds for the first 10 days averaged eight per day. These were spread over a 16 hour long day. While we could find no data on the frequency of feeds in any parent-reared *Ptilinopus* species, data from other parent reared pigeon species showed the number of feeds were higher in the first two to three days and then dropped off markedly thereafter (Skutch, 1991).

2. Filling the crop to capacity at each feed. In parent reared parrots a crop filled to its capacity speeds the rate at which food passes out of the crop and is digested (Voren & Jordan, 1992). Care was taken not to overfill or overstretch the crop.

3. Not allowing the crop to fully empty between feeds. This ensured that food was available for assimilation by the chick throughout the 16 hour feeding day. The crop was allowed to empty completely overnight, to reduce the risk of a bacterial infection.

From a hatch weight of 5.7g, the chick achieved 25g at 10 days, close to 25% of the adult weight (Higgins & Davis, 1996). On the 20th day the chick weighed 67g. Hand-feeding ceased on the 58th day when the chick weighed 103g (see Table 2a). Table 2b shows comparable weight gains for a wild reared conspecific and for a captive parent-reared Rose-crowned Fruit Dove *P. regina*, a similarly sized sympatric congener, obtained from Higgins and Davis (1996).



Young *P. superb* at 15 days old alongside surrogate female puppet

Weaning was encouraged by:

1. Including chopped fruit and pulses in the rearing mix. This encouraged the chick to mandibulate the food particles before it swallowed them. This contrasted with the reflex swallowing action it had hitherto used when fed the mix.
2. Offering food from a pair of forceps, particularly favourite food items such as tinned guava.
3. Placing a female congener in its enclosure to stimulate copycat feeding.
4. Reducing the amount of hand-rearing mixture fed to the chick.

Table 1. Superb Fruit Dove hand-rearing diet

Day 1-4	Day 5-9	Day 10-14
Basic Mix [†] 100ml Saline	Basic Mix [†] 28g fruit puree 70ml saline	Basic Mix [†] 28g fruit puree 92g wheatbread 30ml saline
Day 15-19	Day 20-43	Day 44-80
Basic Mix [†] 28g fruit puree 50g wheatbread 40ml saline	Basic Mix [†] 28g fruit puree 50g wheatbread 10ml saline 100g sprouted pulses	Basic Mix [†] 28g fruit puree 50g wheatbread 100g sprouted pulse 100g banana (fresh) 263g guava (tinned) large teaspoon peanut butter
[†] Basic Mix 250g quark 250g tofu 90g hard-boiled egg 1 level teaspoon SA37 1 level teaspoon calcium lactate		

Table 2a. Superb Fruit Dove rearing chart

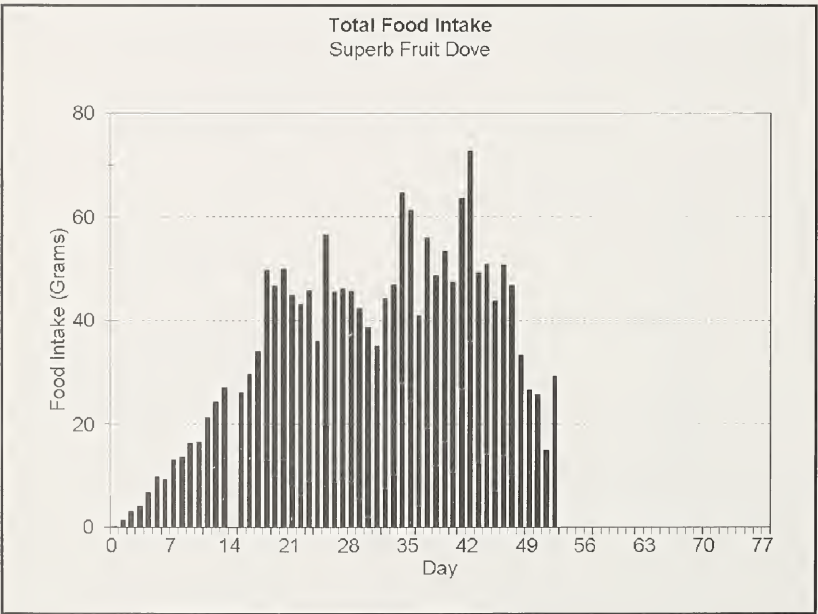
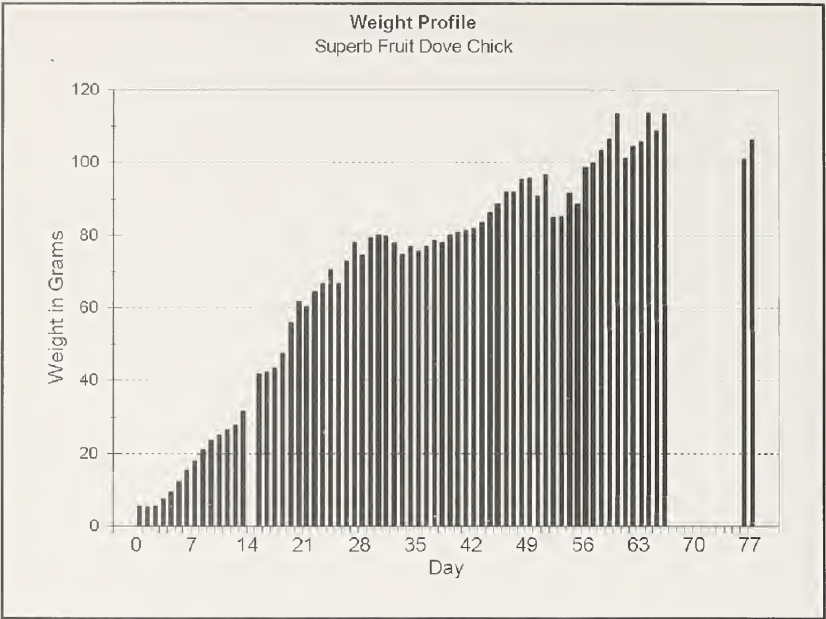
Day	Weight in Grams	Total Food Intake (g)	No. of Feeds	Brooder Temperature	Comments
0	5.7	0.1	3	36	
1	5.4	1.4	10	36	
2	5.6	3.2	8	36	Wing pin feathers showing
3	7.5	4.2	9	35	Eyes opening
4	9.3	6.7	8	35	Put onto twigs
5	12.5	9.9	9	33.5	
6	15.5	9.4	8	33.5	Puppet introduced
7	18.0	13.1	7	34.5	
8	21.0	13.7	7	34	
9	23.8	16.5	7	33	
10	25.0	16.8	7	32.5	
11	26.7	21.3	7	32.5	
12	27.9	24.4	7	32	
13	31.6	27.2	7	31	
15	42.0	26.2	6	30	Moved from brooder to small cage
16	42.6	29.7	5		Perching
17	43.6	34.3	4		
18	47.7	49.8	4		
19	56.0	46.7	4		
20	61.8	50.0	4		Took first drink
21	60.4	45.0	3		Slight weight loss
22	64.8	43.2	3		
23	67.0	45.9	3		

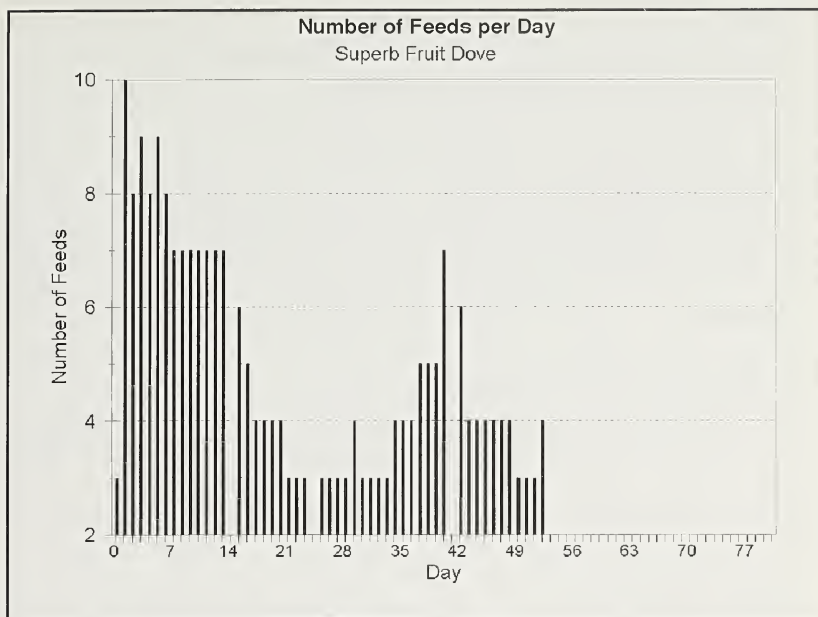
Table 2a. Superb Fruit Dove rearing chart (cont'd)

Day	Weight in Grams	Total Food Intake	No. of Feeds	Comments
24	70.6	36.0	2	Attempting to fly
25	67.0	56.6	3	
26	73.2	45.6	3	
27	78.2	46.1	3	
28	74.5	45.7	3	
29	79.4	42.4	4	Transferred to Bird House
30	80.1	38.6	3	
31	79.6	35.2	3	
32	78.0	44.3	3	
33	74.8	46.9	3	
34	77.2	64.8	4	
35	75.8	61.2	4	
36	77.2	41.0	4	
37	78.6	56.1	5	
38	78.1	48.8	5	
39	80.2	53.5	5	
40	80.9	47.4	7	
41	81.5	63.6		
42	81.9	72.8	6	
43	83.7	49.3	4	Adult female added for company
44	86.4	51.0	4	
45	88.9	43.7	4	
46	92.0	50.9	4	
47	92.0	46.8	4	
48	95.5	33.5	4	
49	95.9	26.7	3	
50	91.1	25.7	3	
51	96.7	14.9	3	
52	85.1	29.3	4	Presume started to feed itself Feeding from tweezers
53	85.3			
54	91.8			
55	88.8			
56	98.8			
57	100.0			
58	103.6			
59	106.7			
60	113.5			
61	101.4			Hand feeding ceased
62	104.8			
63	105.9			
64	113.9			
65	108.9			
66	113.5			
76	101.1			
77	106.4			

Table 2b. Comparable weight gains

Day	Weight Wild Reared <i>P. superbus</i>	Weight Captive Reared <i>P. regina</i>
0		6.7
1	8.3	
2	11.7	
3	18.3	
4	24.1	18.5
5	28.3	
6	31.6	
7	32.7	
8		24





Imprinting

The sensitive phase for learning species specific visual characteristics occurs at an early stage in a pigeon's life (Baptista et al. 1997). A puppet modelled on a female Superb Fruit Dove was therefore introduced to the chick on the sixth day, three days after the chick eyes had begun to open. Ideally the puppet would have been introduced earlier. The chick's response to the puppet was to beg for food. This it did by calling and by biting the bill of the puppet. In experiments presenting the syringe and the puppet simultaneously to the chick, the puppet would always be selected in preference to the syringe, while only the former provided food. The chick would also attempt to be brooded by the puppet. As it was unable to get underneath the puppet it would snuggle as close as possible beside it. At a later developmental stage the chick would perch leaning against the puppet, which was attached to a perch, thus adopting the same behaviour as in parent reared chicks (pers. obs.).

The hand-reared chick, which is a male, has been housed with a female *P. superbus* partner since March 1998. The bird has not shown any apparent aberrant behaviour and while it is not afraid of its keepers it equally does not approach or like to be approached by them. The chick will sometimes utter a rapid two note 'peep-peep' call in response to the same call from the keeper. This call became evident mid-way during its development. The significance of this call being carried though into adulthood has yet to be evaluated. The two birds have been shown to be compatible cage mates and we await any future signs of pair bonding.

Summary

We are unaware of any previous successful attempt to raise a *Ptilinopus* fruit dove by hand, straight from hatching. A number of *Ptilinopus* and other tropical fruit doves and pigeons are threatened with extinction (Collar et al. 1994) and captive breeding programmes may prove an aid to their continued survival. For example, the American Zoo and Aquarium Association's (AZA) Pigeon and Dove Taxon Advisory Group already runs a programme for the Mariana Fruit Dove *P. roseicapilla* and we anticipate that hand-rearing may occasionally prove to be an invaluable aid to such programmes.

Products mentioned in the text

Quark (Sainsburys) & Tofu: J. Sainsbury Plc., Stamford Street, London SE1 9LL, UK.

Tinned Guavas: Peaty Mills Plc., Bridge House, Borough Grn., Sevenoaks, Kent TN15 8PS, UK.

Heinz Pure Fruit: H. J. Heinz Co. Ltd., Hayes, Middlesex UB4 8AL, UK.

Organic Mixed Bean Sprouts (Aduki, Mung, Lentil, Chick Pea): Skysprouts, Totnes TQ9 7LP, UK.

SA37 (Multivitamin general Supplement): Intervet UK Ltd, Science Park, Milton Road, Cambridge CB4 4FP, UK.

Calcium Lactate BP: J. M. Loveridge Plc., Southbrook Road, Southampton SO15 1BH, UK.

Meridian Peanut Butter (Smooth, no salt): Meridian Foods, Corwen, Clwyd LL21 9RR, UK.

Organic Sprouted Wheat Loaf: Sunfood Ltd, Unit 10, Vanguard Trading Centre, 16 Marshgate Lane, E15 2NH.

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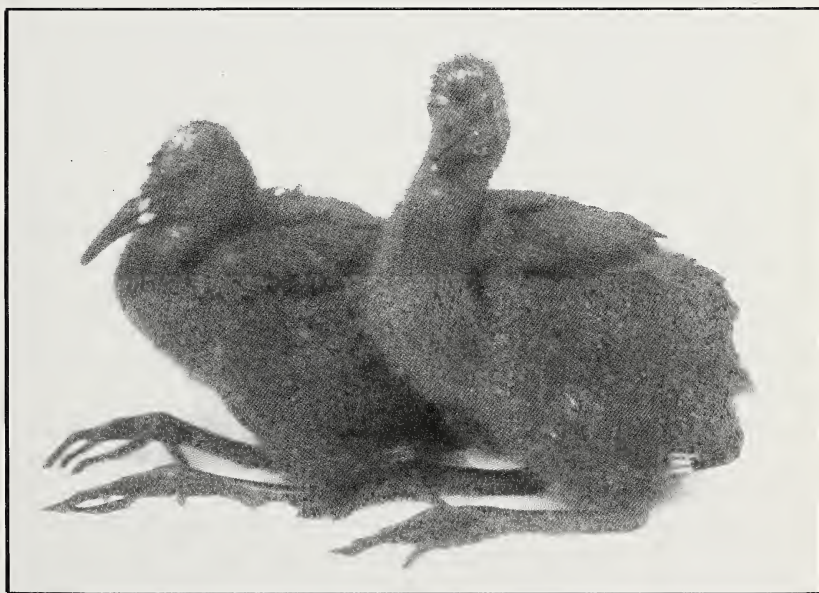
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HAND-REARING PUNA IBIS AT THE OKLAHOMA CITY ZOOLOGICAL PARK

by Chris Smith

The Puna Ibis *Plegadis ridgwayi* has been successfully hatched and reared at the Oklahoma City Zoological Park since 1991. As of 1997, 15 Puna Ibis chicks had been hand-reared. These chicks were successfully reintroduced to their parent flock without any signs of imprinting.

Puna Ibis measure 56cm-61cm (approx. 1ft 10in - 2ft). The plumage is dark purple with a metallic sheen on the coverts with the head and neck dark chestnut. Although similar in appearance to the Glossy Ibis *P. falcinellus*, this species is distinguished by having a shorter bill and tarsi. Immature and non-breeding birds have white streaks over the head and neck. Bare areas around the bill and eyes are red during the breeding season. The legs are black. Sexes are similar in appearance, but males are larger and heavier. There is also a difference in the length of the bill between the sexes. The male's culmen measures from 108mm-127mm, while the female's bill is only 86mm-95mm (Blake, 1977).



Puna Ibis *Plegadis ridgwayi* at three weeks old

The species is found in highland swamps, mudflats and wetlands in Peru, Bolivia, northern Chile and north-west Argentina. Population estimates have found the greatest numbers in Peru; 8,000 on Lake Junin and 1,300 at Laguna Arapa (del Hoyo et. al. 1992). These birds are also common residents in areas around Lake Titicaca. Smaller populations are found in Chile and Argentina. The Puna Ibis is common in some parts of its range and is considered non-endangered. However, the encroachment of cattle herders and land development into the wetlands is an increasing threat to the species habitat (Hancock et. al. 1992).

The December 1996 *International Species Information System Bird Abstract* reported 99 specimens (40. 37. 22) in 12 zoological institutions throughout the world. The Oklahoma City Zoological Park has the largest collection with 21 (8. 8. 5) birds. Five institutions, including the Oklahoma City Zoological Park, reported hatchings in 1996. Twelve hatchings were reported in 1996 of which seven survived. Three parent-reared chicks hatched and survived at Oklahoma City in 1996, and in 1997 nine additional chicks were successfully hand-reared.

Husbandry

The Puna Ibis has been exhibited at the Oklahoma City Zoological Park since 1989 when 4. 4 birds were brought together from several zoological institutions. All of these birds were wild caught. An additional 1.2 wild caught birds were added to the flock in 1990. In both 1995 and 1997, 2.2 birds were added to the collection. Both pairs of these birds had wild origins as well. All other birds in the flock are those that have been hatched and reared at the Oklahoma City Zoological Park.

This species is exhibited in an outdoor aviary, measuring roughly 70m x 30m (approx. 230ft x 99ft), with an average height of 9m (approx. 30ft). The exhibit is multi-tiered and features several pools, waterfalls, gunite cliffs and rockwork, and a variety of plants and trees. The ibis are exhibited with a diverse selection of South American bird species, most of which are waterfowl and shorebirds. The ibis are moved to a wintering facility when temperatures are consistently below -6°C (21°F).

Their diet consists of Nebraska Bird of Prey Diet, Flamingo Fare, chopped and blended smelt, krill and Purina Game Fish Chow. Vitamin supplements Vionate and Osteoform are sprinkled over the food.

Breeding and nesting has occurred from late April to early September. The preferred nest sites have been in a Weeping Willow *Salix babylonica*, approximately 9m (30ft) in height. Several wire nest baskets approximately 30cm (12in) in diameter were placed throughout the willow tree. The birds also built their own nests. Small sticks 20cm - 30cm (approx. 8in - 12in) long and 5mm - 10mm (approx. 1/4in - 4 1/2in) in diameter were the most commonly used construction materials. The nests appear as untidy bundles

of sticks, usually located between larger branches or in the crotch of the tree.

The Puna Ibis has been successfully bred at the Oklahoma City Zoological Park since 1991, when five chicks were hatched. Two of these were hand-reared. In 1992, the flock was held off-exhibit during the summer due to construction. Several eggs were produced but none hatched.

After the flock was returned to the aviary in 1993, two more chicks were hatched and reared by the parents. In 1994, four artificially incubated eggs hatched but no chicks survived. After 2.2 wild caught birds were added to the flock in 1995, four chicks were successfully hand-reared. In 1996, three more chicks were parent reared. Nine chicks were hand-reared in 1997, after a further 2.2 birds were added to the flock. From 1991 to 1997, a total of 36 chicks have hatched at the Oklahoma City Zoological Park, with 23 surviving. Of these, 15 were hand-reared.

Incubation and Hand-rearing Methods

Eggs, when found on the ground, were placed in an incubator set at 37.5°C (99.0° F). The eggs were cleaned in a 10% iodine solution before being set in the incubator. Humidity was maintained at 48 - 50%. The eggs were rotated half-way in alternate directions five times daily. The incubation period was 20 - 22 days. Most chicks hatched about 24 hours after pipping.

The chicks were left in the incubator for 24 hours after hatching, to allow them time to absorb the yolk sac and to dry off. Afterwards the chicks were removed to an isolette with a temperature initially at 33°C (91.4°F), and gradually decreased to the chicks comfort. Small bowls covered with a terry cloth were used as nests. Small sticks 8cm-10cm (approx. 3in-4in) in length and about 5mm (approx. 1/4in) in diameter were placed in bowls for the chicks to grasp. This appeared to help them maintain balance and prevent their legs from splaying. Larger sticks were used as the chicks grew.

The diet consisted of Nebraska Bird of Prey Diet and krill, blended into a semi-thick gruel that could be fed through a syringe. Chicks were fed with a 1cc syringe for the first week. As the chicks grew, 3cc and eventually 12cc syringes were utilised. Vitamin supplements Vionate and Osteoform were added to the formula. Feedings were offered five times daily at two-hour intervals (08.00hrs - 17.00hrs). An additional night feeding was offered for the first two weeks. Water was also offered via a syringe during each feeding. The highest growth rates occurred over the first seven days. The average weight of the chicks increased from 23g to 68g during this time frame (Table 1). The chicks averaged slightly over a 20% daily weight gain through the first week, with the highest daily average being 27% (Table 2). Overall, the rate of growth decreased after six days. The average weight of the chicks increased steadily on a daily basis, with slight fluctuations when changes were made to their diet (see Graph).

The chicks were moved out of the isolette and into a brooder box at two weeks of age. The brooder box measured approximately 2.4m x .6m x 0.35m (approx. 8ft x 2ft x 1ft 2in). A heat lamp was suspended about 75cm (2ft 5in) above the bottom of the box. Only a portion of the area used by the chicks was heated, to allow them to acclimatize to cooler temperatures. The temperature under the heat lamp was kept near 30°C (86°F). The brooder box could be divided into four sections to adjust to the size and number of chicks. Chicks of similar size were kept together without any problems.

During the third week, the chicks began eating solid food. Nebraska Bird of Prey Diet soaked in water was offered by hand in the form of small meatballs. Soaking the diet made it easier for the chicks to swallow and helped them from becoming dehydrated. The chicks also began eating and drinking from dishes placed in their brooder.

At four weeks of age, the chicks were nearly adult size and were moved out of the brooder area to the wintering facility used to house the flock during inclement weather. The wintering area measures about 6m x 3m x 3m (approx. 20ft x 10ft x 10ft) with a pool approximately 5m x 2.5m (17ft x 8ft) in area with a maximum depth of 30cm (approx 12in). Landscape matting and outdoor carpeting were placed over the dry concrete floor. Perches that spanned the width of the room were installed 2m-3m (approx. 6ft 6in - 9ft 9in) above the ground. The birds also had access to an outdoor yard, about the same size as the wintering room, with a sand substrate. At this time the chicks were weaned from hand-feeding altogether. The chicks continued to beg for food from keepers until about six weeks of age.

Imprinting does not appear to have been a problem with these hand-reared ibis. Although the chicks seemed imprinted on people when young, they gradually became less interested in the keepers after they had been weaned from hand-feeding. Hand-reared birds that have been introduced to the flock did not appear to have any difficulties associating with them. Aggression or incompatibility has not been encountered with any of the introductions between hand-reared juveniles and the adult members of the ibis flock.

Products Mentioned in the text

Flamingo Fare: commercial diet for flamingos and wading birds manufactured by Reliable Protein Products, Rancho Mirage, California 92270, USA.

Nebraska Brand Bird of Prey Diet: packaged by Central Nebraska Packing Inc., North Platte, Nebraska 69101, USA.

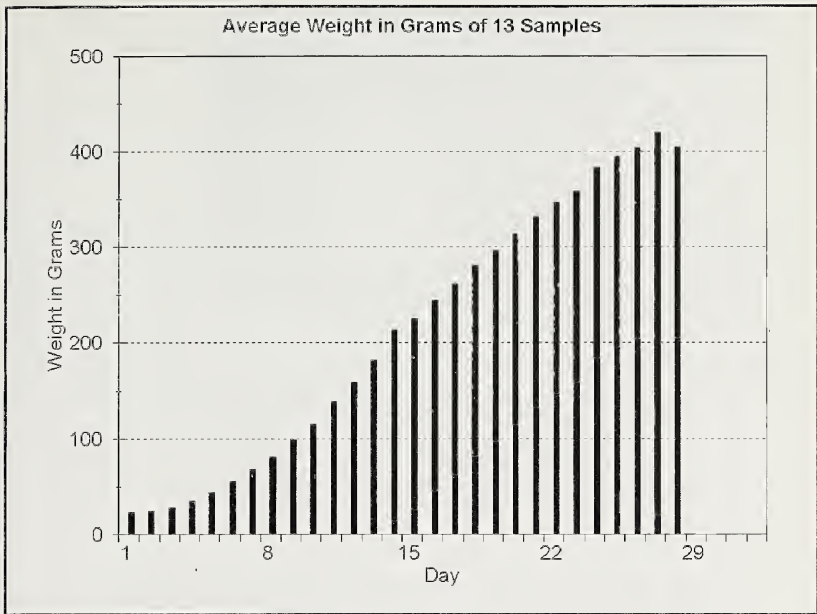
Osteoform: calcium-phosphorous and vitamin powder supplement produced by Vet-A-Mix, Shenandoah, Iowa 51601, USA.

Purina Game Fish Chow: floating fish food manufactured by Purina Mills Inc., Missouri 63166, USA.

Vionate: vitamin and mineral powder manufactured by Gimborn-Rich Health, Atlanta, Georgia 30340, USA.

Table 1. Daily weights (in grams) of hand-reared Puna Ibis

Day	IBIS30	IBIS31	IBIS32	IBIS33	IBIS47	IBIS48	IBIS49	IBIS50	IBIS51	IBIS52	IBIS53	IBIS54	IBIS55	Mean
1	26.8	23.1	23.9	23.2	26.2	21.8	24.6	23.0	21.7	24.9	20.9	22.2	19.6	23.2
2	25.5	23.8	24.3		26.2	21.0	26.0	24.8	24.0	27.8	23.9	26.4	24.5	24.9
3	24.5	24.6	26.4	22.6	29.4	25.2	27.8	28.2	28.1	32.0	29.3	31.5	34.4	28.0
4	28.0	31.9	31.6	28.4	38.0	31.8	31.7	38.7	24.8	49.4	45.8	41.7	31.3	32.9
5	32.0	40.3	40.0	32.8	52.2	48.5	42.9	56.5	31.5	56.0	59.7	42.1	37.6	44.0
6	38.6	50.1	49.5	44.0	69.0	62.0	61.2	62.2	43.3	73.1	82.0	53.5	39.0	56.0
7	47.0	66.7	61.6	51.0	76.2	68.2	65.2	81.9	55.1	85.5	106.4	74.5	49.6	68.4
8	56.8	82.4	80.2	59.3	79.8	87.5	80.2	100.6	60.0	93.0	122.5	93.2	63.0	81.4
9	61.1	99.6	106.4	72.6	102.5	114.4	99.9	106.0	58.8	107.6	142.8	116.3	90.1	98.3
10	69.0	101.5	117.7	91.2	137.9	130.2	103.4	131.1	60.4	140.6	187.3	144.0	88.2	115.6
11	78.6	134.0	136.5	113.0	144.4	158.6	136.3	157.6	67.2	173.0	232.4	170.0	100.5	138.6
12	96.1	163.6	164.1	122.7	160.0	171.3	165.4	179.8	67.1	187.2	255.0	199.6	127.4	158.4
13	127.5	183.1	184.9	141.1	192.8	179.5	174.6	202.6	71.8	211.1	295.1	238.0	162.5	181.9
14	151.0			151.3	214.9	201.1	215.5	210.0		231.0	304.8	269.4	186.8	213.6
15	179.4	211.3	219.7	157.4	237.2	217.5	231.6	239.6	88.0	259.9	363.6	300.4	223.5	225.3
16	210.2	226.2	234.3	173.6	258.0	238.2	263.3	258.0	116.3	269.2	348.8	345.0	242.2	244.9
17	235.4	257.4	252.7	188.0	264.6	243.6	282.5	279.0	120.4	272.6	373.2	383.9	251.0	261.9
18	260.8	291.4	286.2	208.5	287.4	264.2	306.0	287.1	127.1	297.8	406.4	350.5	281.4	281.1
19	273.8	350.3	326.9	206.3	254.8	286.0	334.1	309.2	94.7	317.1	430.7	370.1	299.0	296.4
20	304.0	372.5	362.8	200.2	308.2	284.7	349.4	328.2	101.8	336.3	457.5	371.0	309.5	314.3
21	329.8	390.8	378.0	192.9			364.6	334.9	111.8	350.0	470.5	391.0	334.8	331.7
22	380.2	403.9	386.8	235.2	329.5	307.5	376.1	344.7	141.1	362.0	476.0	424.8	339.5	346.7
23	416.7			267.5	338.5	317.0	403.4	351.6	144.5	359.3	488.1	489.0	362.4	358.0
24	425.7	416.8	444.1	276.3	355.6	324.1	397.0	383.6	162.0	385.4	525.3	521.0	361.0	382.9
25	422.3	427.1	452.3	269.7	371.0	334.0	412.0	390.0	179.8	399.5	548.4	546.5	384.8	395.2
26	484.5			287.6	372.2	336.5	430.1		188.9	405.4	549.3	579.8		403.8
27	516.4			294.0	391.0	355.9			216.1	420.5	593.0	572.1		419.9
28	539.8			275.6	381.4	354.0			251.2	426.6	604.4			404.7
29	555.5	478.1	504.7											
30	584.0	492.3	509.5	356.4										



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HUSBANDRY AND BREEDING OF THE PAPUAN MOUNTAIN PIGEON *Gymnophaps albertisii* AT VOGELPARK WALSRÖDE

by Martina Müller

According to the 1995 European Endangered Species Breeding Programme Taxon Advisory Group Survey, only three European institutions were keeping a total of 3.5 Papuan Mountain Pigeons *Gymnophaps albertisii*: London Zoo had two females, the French zoo, Beauval two pairs and Vogelpark Walsrode a single pair at that time. No successful reproduction within the previous five years was reported. To our knowledge, there are also some private aviculturists who have this species in their collections but successful breedings seem not to have occurred with these. This is in some ways surprising as this pigeon is a distinctive and interesting member of the large group of fruit pigeons which deserves more attention from the avicultural community.

The Papuan Mountain Pigeon is a medium-sized approx. 35cm (13³/₄in) long streamlined pigeon with a whitish breast and throat contrasting well with the maroon belly and dark grey upperparts. Both sexes show an expanded area of bright red skin around the eyes which relates to the species' other common name of Bare-eyed Mountain Pigeon. Other features are the greyish bill with a pinkish tip and red cere, as well as strong red feet and legs. Females can easily be distinguished from males in having the breast variably suffused with grey and a broader grey edging to the chestnut throat. Juveniles of both sexes resemble females but are duller in colour and lack the red eye-skin and feet. The sex of young birds can be determined on fledging, at which time the breast of the male is already much lighter than that of the female. The adult plumage, with the white breast in males and intensive red orbital skin, bill and legs of both sexes, is attained when the birds are one year old.

Taxonomically, the Papuan Mountain Pigeon forms a superspecies with the Long-tailed *G. mada* and Pale Mountain Pigeon *G. solomonensis*. The relationships of the genus are, however, uncertain. These species seem to be somewhat similar to some *Ducula* spp, such as the Pinon's Imperial Pigeon *Ducula pinon*, in terms of colour and colour patterns. Two races of the Papuan Mountain Pigeon are recognised: *G.a. exsul*, which is found in the north-west Moluccas, is somewhat larger and darker than the nominate race, *G.a. albertisii*, to which this article refers.

Widely distributed throughout New Guinea and the adjacent islands of Yapen, New Britain, New Ireland and Goodenough, this pigeon frequents

*Dieter Rinke***Adult male Papuan Mountain Pigeon***Dieter Rinke*

Whereas the male has a white breast, that of the female is grey

primary forest from sea-level up to 3,350m (approx. 11,000ft), or sometimes even higher. Therefore the birds do not seem to be very sensitive to harsh climatic conditions in Europe, making them suitable for our aviaries.

Little is known about the general habits of the species. It seems to be a shy bird and occurs mostly in the hills and mountains. Commonly seen in groups of 10 - 40, sometimes even up to 80, these flocks fly very fast over lowland forest in the vicinity of hills when their wings produce a 'rushing'

sound in flight. In cloudy mountains these noisy wing-beats sometimes indicate the presence of flocks in flight, even if they cannot be seen. The species seems to be partly nomadic as large numbers visit coastal forests during the rainy season from October until March. The birds forage in the canopy where they take a variety of fruits including figs and drupes of the laurel *Cryptocarpa tessalata*.

The display flight of the male - performed over fairly steep mountainous terrain - has been described as 'spectacular' by a number of observers: from a favoured perching place the bird swoops steeply downwards before, with swift wing-beats, flying almost vertically upwards. At the peak of its climb it pauses and turns, and then, with closed wings, falls rapidly like a stone almost vertically, finally pulling out of the dive and arcing back upwards to its perch.

During the rainy season the birds place their nest, a small platform of sticks, in a tree or a depression in short dried grass on the top of a rock-face, at a height of about 5m (16ft 3in). One white egg forms the clutch. Semi-colonial nesting has sometimes been reported. Usually a silent species, loud booming calls can be noted during the breeding season.

About six years ago Vogelpark Walsrode started to keep Papuan Mountain Pigeons when two pairs arrived at the end of 1993 from the breeding centre on Mallorca. One pair was housed in the pheasantry for exhibition purposes, while the other was placed in a densely planted enclosure in the breeding facility for pigeons (which is not open to the public). This pair remained timid while the two other birds, having daily contact with visitors, became rather tame after a short period of time. This might have been one of the preconditions for breeding the species.

The birds in the pheasantry shared their enclosure with various other species: finches, living in the upper parts of the aviary like the pigeons, as well as ground-dwelling birds such as pheasants. The mountain pigeons showed no forms of aggression towards the other species, however, a pair of Bali Starlings *Leucopsar rothschildii* had to be removed from this enclosure after attacking the pigeons.

The diet for these pigeons does not show any differences compared to the one we use for other big fruit doves and consists of various fruits, depending on the season. In addition, lettuce, oatflakes, soaked dog pellets and sometimes even pieces of freshwater fish are offered since we have noticed that other species of fruit doves, kept in mixed enclosures, also feed on this item. The fruits are cut into pieces of different sizes - from very small up to 1cm (1/2in) cubes. However, the birds' preference is for whole berries like grapes, redcurrants, blueberries, etc.

As the mountain pigeons live in forests at high elevations, they are not very sensitive to the cold during European winters. Therefore, at Vogelpark

Walsrode the birds always have access to outdoor facilities where temperatures can be as low as -10°C (14°F) and of which they often take advantage. A temperature of some 5°C - 10°C (41°F - 50°F) is maintained in the birds' indoor accommodation during winter.

Once the mountain pigeons had settled down, the pair on exhibition began their first attempts at breeding. During the years of keeping the species at Walsrode it has become obvious that compatibility between partners is very important for successful reproduction. If the birds fail to get along well, the territorial male chases the female to the point of exhaustion and as a consequence such birds have to be introduced to another partner.

The male's courtship display differs from that observed in most pigeons: the typical situation, in which the male sits alongside the female, presenting an inflated crop and pestering the female, has not been observed. In this species the male perches on a conspicuous dead tree-limb, clipping his wings strongly and at length, and looking more like a bird-of-prey than a pigeon. The question is whether this behavioural pattern is something like a stylized flight through territory - comparable to the 'wing-whirring' of male pheasants - or if the normal courtship display can only be performed incomplete due to the lack of space in captivity. Interestingly enough, young males display this behaviour shortly after fledging. According to observations made at Walsrode this is a behavioural pattern correlated to the bird's sex; it is never seen in female mountain pigeons.

The first egg-laying occurred here on December 9th 1994, almost a year after the birds' arrival. Unfortunately this egg was infertile. About two months later, on February 15th 1995, a second clutch was found in the nest. After an incubation period of 23 days we found parts of an eggshell under the nest, indicating that a chick had hatched. This was the first breeding of a Papuan Mountain Pigeon at Vogelpark Walsrode.

The newly-hatched chick is covered with very dense, dark reddish-brown down, giving it a somewhat atypical look for a pigeon. When the chick was about one week old, the adult birds left it alone for the first time. At first they did so for only a short period, but some days later they did not return to brood the chick at all. This behaviour did not cause any complications so far as the young bird's development was concerned (even in February!) since it seemed to have a well-developed thermal regulation. About 25 days later the chick, now well feathered, fledged but stayed close to the nest for some days. I should also mention that at one time there was a young pigeon which left the nest after 39 days, which was slow compared to the other chicks hatched at Walsrode. For a further 14 days the juveniles are fed by their parents. At no time did we observe any type of aggression between young and adult Papuan Mountain Pigeons which remained together in one enclosure, even when the parents started to breed again.



Dieter Rinke

The young male's breast feathers are lighter than those of the young female at a comparable age

Eight *Gymnophaps albertisii* have been reared successfully at Vogelpark Walsrode during the past four years and we are now keeping four pairs, of which two are breeding. In order to increase the genetic diversity of our flock, London Zoo sent their two females to Walsrode and one of these has already reproduced. With these promising results we hope to establish a viable population of this interesting pigeon in European collections.

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CHESTER ZOO BIRD REVIEW 1998

by Roger Wilkinson

Christmas Day morning at 7.00am 1997 saw members of the bird staff working in the dark to shore up broken windows and net over open roofs resulting from the gales of Christmas Eve. They were soon joined by other members of the Animal Division and Estates Division in emergency repair work that resulted in most missing their Christmas lunches to secure the safety and welfare of stock throughout the zoo. The main damage was to the Tropical Realm building which lost large sections of the roof over the



R. Wilkinson

Yellow-throated Laughing Thrush

hornbill enclosures and reinforced glass skylights over the main free-flight bird areas. Other damage included windows blown out of the Bird House, major damage to the adjacent Bird Arcade roof and fencing of the crane and waterfowl paddocks. Stock losses were mainly of free-flying pigeons and doves which escaped from the Tropical Realm but also included a number of smaller birds.

This storm damage necessitated re-programming expenditure and resulted in not only a completely new and much better roof over the damaged area of the Tropical Realm but also the re-building of the hornbill enclosures

and later in the year also the Congo Peafowl aviary to a much improved standard. However this forced the temporary re-housing of the Great Indian Hornbills *Buceros bicornis* and Rhinoceros Hornbills *B. rhinoceros* precluding any breeding attempts by these in 1998. The Bird Arcade was also re-roofed and temporary repairs made to the Bird House and crane fencing. The Bird House having been built in 1965 as a Temperate Bird House and perhaps given its structure also then seen as a 'temporary' Bird House, had been under review for replacement for at least the last 15 years. Decisions were made for the Bird House to be demolished and the crane areas re-fenced at the end of the 1998 breeding season.

The Bird House has given many visitors pleasure over the last 30 years and been the site for the successful breeding of many species from the first UK breeding of Bare-faced Curassows *Crax fasciolata* in 1966, a year after the building was opened, to our first success with the parent-rearing of a Scarlet Ibis *Eudocimus ruber* in 1998. Lilac-breasted Rollers *Coracias caudata* were also successfully bred there in 1998. Other species of particular interest which have bred over recent years in the Bird House include Blue-crowned Motmots *Momotus momota*, Trumpeter Hornbills *Bycanistes bucinator*, Palawan Peacock Pheasants *Polyplectron emphanum* and Bali Starlings *Leucopsar rothschildi*. The loss of the Bird House has necessitated the relocation of its former occupants either elsewhere in the zoo or to other collections. We are currently building on the site of the old Bird House a new 'Islands in Danger' exhibit. As well as birds this will house invertebrates, fish, amphibians and reptiles selected to include both those threatened in the wild and managed within zoo breeding programmes and those that illustrate particular biological concepts associated with living on islands. The exhibit will include some exciting species including Red Birds of Paradise *Paradisea rubra* from the Wildlife Conservation Society, New York, and Komodo Dragons *Varanus komodoensis* from Miami Metrozoo.

'Always Building' was the motto of Chester Zoo's founder George Mottershead and this was certainly the case for the zoo in 1998. Whilst work continued elsewhere a major redevelopment of the Humboldt's Penguin *Spheniscus humboldti* facility included the demolition of the filtration plant and kitchen area built in 1981, and the building of larger accommodation to house the new water treatment equipment, a new kitchen and keeper area, and refrigerated cold room for fish storage. The pool has been re-landscaped with natural looking rock-work and a waterfall and new rock effect nesting areas provided. The new system which is now installed allows the penguins to swim in salt water where previously they had a freshwater pool. This not only provides a more natural environment for the penguins but also allows the use of a water treatment regime that includes ozone treatment and protein skimming, in addition to sand filtration and UV disinfection. With the new

pumping systems water can now be re-circulated through the water treatment plant with a turnover of one hour, at least twelve times faster than previously.

For winter 1997 and spring 1998 this meant that the penguins had to be re-housed to allow the building work to progress. During this time the penguins were maintained in the Chilean Flamingo *Phoenicopterus chilensis* indoor winter quarters and allowed access to a fenced off outdoor area adjacent to this building. This allowed the birds access to the large but shallow indoor pool and we were pleased to find no health problems resulted from this necessary temporary re-housing. Indeed the penguins settled very quickly and in early spring signalled their intention to breed by excavating nesting burrows in their outdoor pen. Our penguins are included within the EEP (European Endangered Species Breeding Programme) Humboldt's Penguin breeding programme.

Because we have bred so many in previous years our stock is particularly well represented in other European zoos and we have been asked only to breed from new stock provided through the EEP coordinator. In 1997, with the help of Whipsnade Zoo we imported three new penguins from Emmen Zoo, Netherlands. Two of these had paired together and were amongst those penguins that laid eggs in 1998. Whilst the other penguin eggs were removed and not allowed to hatch, those of the Emmen pair were artificially incubated and as a result two fine chicks were hand-reared. These have now been introduced into the recently redeveloped enclosure with the other penguins.

Whilst the Humboldt's Penguins were being housed in the Chilean Flamingo quarters the Chilean Flamingos were mixed over the winter with the Caribbean Flamingos *P. ruber ruber*. These were separated again into single species flocks prior to the breeding season but this disruption to their normal wintering routine may have led to them being later in initiating egg-laying than in previous years. Nevertheless seven Chilean and two Caribbean Flamingos were hatched with the last Chilean chick hatching in October.

Following the damage from the Christmas Eve gales, more unseasonal weather with particularly wet heavy snow in mid-April caused further damage and disruption to the Bird Department. This heavy snow continued settling overnight and not only brought down trees and power lines but severely tested the structure of the aviaries. Damage was caused mainly to the large aviaries where the weight of snow on the nylon netting resulted in these structures giving at their weakest points but some of the old timber and metal mesh structures also suffered. 'Europe on the Edge', 'Condor Cliffs', the Great Grey Owl aviary, Mauritius Kestrel aviary, Red-crowned Crane enclosure and Oakfield parrot aviaries were all damaged.

The Red-crowned Cranes *Grus japonensis* were sitting a clutch of two eggs only days away from hatching. They valiantly sat through the snow storm despite their aviary having suffered major damage with the snow laden

netting roof only just above their heads but abandoned their nest mid-morning allowing us to take the opportunity to catch and clip the full-winged female before transferring the pair to the only available open-topped pen. The pair then surprised us by settling down to lay a replacement clutch and rear two excellent chicks in their new enclosure. Rapid repairs were made to the aviaries and subsequently three of the larger enclosures have been re-netted with modified fixing methods including steel rather than nylon supporting cables. Two West African Crowned Cranes *Balearica pavonina pavonina* were again reared in 1998. As in previous years these were hatched in the incubator and reared by domestic hens. We had hoped to leave an egg or eggs from a second clutch with the parent cranes but this year they disappointed us by not laying until very late in the summer and then only laying a single clutch. We again had infertile eggs from the Wattled Cranes



R. Wilkinson

Red-crowned Crane with chicks

Buggeranus carunculatus and the White-naped Cranes *G. vipio*. The latter may perhaps not be too surprising in view of the male's age: London Zoo acquired him from Mr. Ezra in 1949. Notwithstanding this and our previous lack of success with artificial insemination when we tried it in 1994, several years with only infertile eggs suggest we should attempt this procedure again in 1999. Two Gough Island Moorhens *Gallinula comeri* were hatched and reared by their parents.

Notable breedings in addition to those already mentioned included a female Andean Condor *Vultur gryphus* hatched and reared by its parents in the new 'Condor Cliffs' enclosure. This was the eleventh chick to be reared at Chester since this pair first bred in 1985 but gave us particular satisfaction in being the first chick in the UK to be successfully parent-reared.

In the 'Europe on the Edge' aviary six Waldrapp Ibis *Geronticus eremita* were reared and Little Egrets *Egretta garzetta*, White-headed Ducks *Oxyura leucocephala* and Red-legged Partridges *Alectoris rufa* all hatched chicks in this enclosure. Red-billed Choughs *Pyrhocorax pyrrhocorax* nested but



R. Wilkinson

Young Thick-billed Parrot

were unsuccessful. The Griffon Vultures *Gyps fulvus*, newly received from Bristol Zoo, laid but only the female incubated and the egg was infertile. As in previous years the European Black Vultures *Aegypius monachus* both took turns in sitting on their nest but no egg was laid. Later in the summer the opportunity was taken to laparoscope the female and veterinary opinion then suggested that the recent termination of egg-laying may be related to a distortion of her reproductive tract.

Waterfowl bred included Cuban Whistling Ducks *Dendrocygna arborea*, Common Shelducks *Tadorna tadorna*, Marbled Teal *Marmaronetta angustirostris*, Meller's Ducks *Anas melleri*, Garganey *A. querquedula*, Falcated Teal *A. falcata*, Chiloe Wigeon *A. sibilatrix*, Ringed Teal *Callonetta leucophrys*, Mandarin Ducks *Aix galericulata*, Carolina Wood Ducks *A. sponsa* and Smew *Mergus albellus*.

Malay Crestless Firebacks *Lophura erythrophthalma erythrophthalma* laid for the first time at Chester and a female chick was reared. The Blyth's



R. Wilkinson

Malay Crestless Fireback Pheasants

Tragopans *Tragopan blythii* also laid for the first time but although a chick hatched it was weak and did not survive. The Satyr Tragopans *T. satyra* were allowed to sit on their own eggs and reared a single chick. Other pheasants reared included Lady Amherst's Pheasants *Chrysolophus amherstiae*, Golden Pheasants *C. pictus* and Himalayan Monal *Lophophorus impeyanus*. Green Peafowl *Pavo muticus*, Common Peafowl *P. cristatus* and Congo Peafowl *Afropavo congensis* were all bred. The Congo Peafowl hatched and reared chicks as a family group comprising the adult breeding pair and their two full-grown male offspring from 1997. These young males were especially active in defending the chicks from the presumed threat represented by keepers approaching the chicks when entering the enclosure and at least one also brooded the chick. The two Green Peafowl were hand-

reared and represent another species bred at Chester for the first time in 1998.

Two Spectacled Owls *Pulsatrix perspicillata* were reared, one by its parents and the other by hand and three Tawny Frogmouths *Podargus strigoides* were bred including the first one to be successfully raised under its parents at Chester. The latter success was due to the keeper's patience in teaching the parents to feed their chick, and taking care to provide supplementary food for the chick when required.

Two Kookaburras *Dacelo novaeguineae* were reared as were three Lilac-breasted Rollers. The African Grey Hornbills *Tockus nasutus epirhinius*, Trumpeter Hornbills and Wrinkled Hornbills *Aceros corrugatus* all attempted to nest. Although the Trumpeter Hornbills had at least one chick in the nest none were reared to independence. The death of our breeding female Wrinkled Hornbill after two unsuccessful nesting attempts in 1998 was a particular blow in that this pair had been so successful in previous years. Following the provision of a natural nest log, clearly to their liking, the Green Wood Hoopoes *Phoeniculus purpureus* reared a female chick on their first breeding attempt, and with that youngster's help in provisioning them, reared two male chicks in a second brood. This was the first time that Green Wood Hoopoes have bred at Chester. Touracos also had a particularly good year with four Violaceous Touracos *Musophaga violacea*, three Schalow's Touracos *Tauraco schalowi*, three Red-crested Touracos *T. erythrophus* and two White-cheeked Touracos *T. leucotis* reared. New to the collection are a pair of Fischer's Touracos *T. fischeri* but these showed no breeding activities this year.

Amongst the smaller insectivorous passerines we were most successful with one pair of Yellow-throated Laughing Thrushes *Garrulax galbanus* from which a total of five chicks were reared by a combination of parent-rearing and hand-rearing. White-rumped Shamas *Copsychus malabaricus* fledged only a single chick losing other chicks from three successive nests. Similarly the Plumbeous Redstarts *Rhyacornis fuliginosus* made three nesting attempts but the only chick reared was hand-reared and proved to be less than robust. The Azure-winged Magpies *Cyanopica cyanea* reared three chicks. Although the Red-billed Blue Magpies *Urocissa erythrorhyncha* had two nests of chicks none were reared to independence. Birds in the free-flight of the Tropical Realm were more successful, with Scissor-billed Starlings *Scissirostrum dubius* fledging chicks for the first time at Chester and Emerald Starlings *Lamprotornis iris* and Red-eyed Starlings *Aplonis panayensis* again reared chicks. Other birds fledging chicks here included Speckled Pigeons *Columba guinea*, Silver-billed Tanagers *Ramphocelus carbo* and Pekin Robins *Leiothrix lutea*. The Silver-eared Mesias *L. argentaurius* appeared to be cuckolded again when their youngster proved once again to be a hybrid with a Pekin Robin. Two African Pied Starlings

Spreo bicolor were hand-reared from incubator hatched eggs. At fledging these youngsters were caged with a single Fischer's Starling *S. fischeri* which proved ideal in caring for these chicks, feeding them on demand until they became independent.

Luzon Bleeding Heart Pigeons *Gallicolumba luzonica* were bred in the upper aviaries of the Tropical House and two Mountain Witch Doves *Geotrygon versicolor* reared in one of the small enclosures in the Bird Arcade. The Superb Fruit Doves *Ptilinopus superbis* hatched a chick in November but unfortunately this failed to survive. New arrivals were a pair of Mindanao



R. Wilkinson

Luzon Bleeding Heart Pigeon

Bleeding Heart Pigeons *G. criniger* and two Golden Heart Pigeons *G. rufigula*. Crested Bronzewings *Ocyphaps lophotes*, Diamond Doves *Geopelia cuneata* and Mexican House Finches *Carpodacus mexicanus* fledged chicks in the Finch Flight.

1998 was a good year for parrot breeding at Chester. The Mount Apo Lorikeets *Trichoglossus johnstoniae* after several unsuccessful nesting attempts fledged two excellent youngsters. This was the first successful breeding of this endangered lorikeet at Chester and to my knowledge the first UK breeding for over 90 years, the first breeding being that in Mrs Johnstone's collection in 1906. There is now a European Studbook (ESB) for this delightful little lorikeet managed from Loro Parque, Tenerife, so we

may hope it has a better chance of now becoming established in European aviculture. Other parrots bred at Chester in 1998 included four species of Amazons, namely one Red-tailed Amazon *Amazona brasiliensis*, two Lilacine (Ecuador) Amazons *A. autumnalis lilacina*, three Green-cheeked Amazons *A. viridigenalis* and three Cuban Amazons *Amazona leucocephalus*. This was especially gratifying in that all the young were parent-reared on show to the public. This was achieved by the Cuban Amazons by isolating the male after the female had laid and allowing her to rear the chicks unaided. In previous years the male Cuban Amazon had severely attacked the female whilst she was rearing chicks forcing the removal of chicks for hand-rearing. The only parrots hand-reared in 1998 were three Blue-eyed Cockatoos *Cacatua ophthalmica*. Two Red-fronted Macaws *Ara rubrogenys*, two Blue-winged (Illiger's) Macaws *A. maracana*, one Yellow-naped Macaw *A. auricollis*, a Thick-billed Parrot *Rhynchopsitta pachyrhyncha*, a Golden-capped Conure *Aratinga auricapilla*, a Blue-throated Conure *Pyrrhura cruentata*, four Greater Vasa Parrots *Coracopsis vasa*, three Derbyan Parakeets *Psittacula derbiana* and a Yellow-backed Chattering Lory *Lorius garrulus flavopalliat* were all parent reared in on-show aviaries. We were especially pleased to breed the Yellow-naped Macaws and Golden-capped Conures as these had not previously bred in the collection.

Despite the difficulties resulting from the gales then the snow, 1998 proved to be good for bird breeding with some 70 species of birds reared from a total of ca. 80 species hatching chicks. However, it is becoming increasingly difficult to be certain of placing surplus stock in known quality housing and for some successful pairs there is a danger of swamping managed populations with their offspring. As such, we now breed certain species only to order and for other species must carefully consider their role within our collection. We will become increasingly selective in terms of both species and individuals selected for breeding. That is not to say bird breeding is less important but it needs to become even more focused. Supporting this the zoo's plans for winter 1999 include the 'Egg Centre', a new incubation and rearing facility with public viewing and educational interpretation. These new developments and our increasing commitments to field conservation depend on maintaining the recent increase in zoo visitors. Continuing zoo improvements and innovations like 'Islands in Danger' should ensure we continue to get the visitor support we need to be better able to contribute to wildlife conservation and education at the same time as providing a good day out.

Dr Roger Wilkinson is now General Curator: Higher Vertebrates and Research Co-ordinator at Chester Zoo. He was recently re-elected to serve as an Avicultural Society Council Member for a further period of five years.

THE RED-BROWED AMAZON *Amazona rhodocorytha*

by Roger G. Sweeney

The Red-browed Amazon, which measures up to 36cm (approx. 14in) long and commonly weighs about 450g (approx. 1lb), is one of the larger of the mainland species of Amazon parrots. The coloration of this species, particularly that of the head, is extremely attractive. The forehead and crown are bright red. The lores are yellow, sometimes becoming orange as the yellow merges into the red of the forehead. The front area of the cheeks and the throat are pinkish-red, with the rear of the cheeks being blue, fading out to green. The patterns of colour merge together, with those of each individual bird being slightly different. The greatest individual variation occurs in the amount of yellow, which can range from almost none to being quite extensive. In sharp contrast to the beautiful coloration of the head, the plumage of the body and wings is mainly green.

The Red-browed Amazon is endemic to a limited area along the coastal region of eastern Brazil. In the past limited numbers of birds were exported, but in recent decades no further exportations have been permitted under Brazilian legislation which prevents the exportation of this species, that has been placed on Appendix 1 of the CITES Convention. Despite having been in captivity for many years, only a small number of birds from the early importations have reproduced. Until recently the European population comprised these ageing adult birds, the majority of which had not reproduced, and a group of second generation birds bred by private aviculturists, all of which were closely related and already showing an inbreeding coefficient.

An EEP (European Endangered Species Breeding Programme) for this species was initiated in 1994, but a number of problems soon became clear. To begin with a number of the important ageing wild caught birds were confiscated birds held by zoos, which could not move them for the purpose of pairing. The strict conditions of membership of the EEP discouraged private aviculturists from participating, so in 1996 there was a recommendation that private aviculturists should pay an annual fee to take part in the EEP. If progress was to be made it was important that more of the founder birds which had the potential to breed, but which had not done so, were encouraged to breed in order to produce new bloodlines of first generation young, which could be moved more easily and used to form new unrelated pairs.

Loro Parque had held a large group of Red-browed Amazons for over a decade, but these had shown no interest in breeding other than to lay a few infertile eggs at irregular intervals through the years. When I took charge of these birds we began by building a large communal aviary, designed mainly

with Amazon parrots in mind, with the intention of using it for the group pairing of non-breeding stock. This aviary was built in the latter part of 1994, and in the spring of 1995, we introduced a group of just over 20 non-breeding Red-browed Amazons. All were introduced at the same time and before the start of the breeding season, to help reduce the risk of aggression. In the event, very little direct aggression was observed. Within the first week though, two birds had to be removed due to their weakened condition, which we believed had been caused by intimidation. The remaining birds settled down well and soon we were able to begin moving the newly formed pairs back in to breeding cages. That season (1995) we recorded our first successful breeding of this species, with a total of five young being reared. The following season (1996) we raised a further 13. During 1997 we began moving many of the adult breeding pairs to the newly completed breeding areas away from the main parque, and due to this only one pair bred in 1997, rearing two young.

In three breeding seasons a total of 20 Red-browed Amazons were reared, but we had still not achieved the successful parent-rearing of the young. Seventeen of them were reared by foster parents, which included Yellow-crowned Amazons *A. ochrocephala*, Green-cheeked Amazons *A. viridigenalis*, Blue-fronted Amazons *A. aestiva xanthopteryx*, Maximilian's Pionus *Pionus maximiliani* and Blue-headed Pionus *P. menstruus*. The remaining three were being reared by their parents as part of a brood of four chicks until at three weeks of age, one was killed and two of the three remaining chicks were found with bite wounds. The three surviving chicks were removed and successfully hand-reared, though one lost an eye due to the injuries inflicted by the parents. Although none of the offspring reared up until the time of writing have been raised by their parents, there is hope that this will change in the near future.

In 1996, when their eggs were removed, one of the breeding pairs of Red-browed Amazons was given an egg from a pair of White-fronted Amazons *A. albifrons* to see if they would hatch the egg and rear the chick. Giving the egg to a smaller species such as the White-fronted would not have been our first choice, but it was the only species with eggs at the time and I really wanted to give the pair of Red-browed Amazons the opportunity to see if they could hatch the egg and rear the chick. This they did successfully, giving hope that in the near future Red-browed Amazons will successfully rear their own young.

The husbandry of Red-browed Amazons was during the time I was Curator at Loro Parque, similar to that of the other *Amazona* species. The birds receive two feeds a day. The first, at 7.00am, comprises a main dish of mixed fruit and vegetable salad, plus a smaller dish containing about 35g of a commercial dietary pellet (Prettybird Hi-protein Select). The salad mixture

contains apple, pear, papaya, beetroot, carrot, alfalfa, lettuce, tomato, orange and pepper, and about 80g of this is given to each pair. At 3.00pm the remains of the morning food is removed and replaced by a clean dish containing dry seeds, cooked beans and nuts. Each pair receive about 80g of this mixture which contains sunflower and safflower seeds, hemp, canary seed, millets, niger, wheat, black-eyed and mung beans, plus very small quantities of peanuts and pine nuts. The Red-browed Amazon is one of the species of the genus *Amazona* which is most prone to obesity. At the end of the breeding season at Loro Parque, each bird used to be caught and subjected to a thorough veterinary examination, during which its weight was recorded and its physical condition assessed. In the case of obese birds, their diet was adjusted to help them shed the excess weight. It was very noticeable to me how birds which had been placed in the pairing flight, and had selected new partners, seemed to be significantly more active and indulged in much more courtship behaviour which I believe helped prevent them from becoming obese.

The exhibition aviaries for Amazon parrots at Loro Parque are of a basic all-wire mesh construction on a stainless steel framework. Shelter is provided only above the feeding area and the entrance to the nest-box, otherwise they are of an open design with vision breaks and shade provided by rows of dense Arecca Palms. The aviaries used to accommodate Red-browed Amazons in the off-exhibit breeding areas are of the suspended type and measure 300cm x 98cm x 98cm (approx. 9ft 10in x 3ft 2 $\frac{1}{2}$ in x 3ft 2 $\frac{1}{2}$ in). The floors of the aviaries are about 125cm (approx. 4ft 1in) above the floor of the service passage, to give the birds a comfortable height at which to perch, slightly above the head height of the keepers. Service access is exclusively from the fronts of the aviaries which extend back from the service access area and have the nest-boxes placed on the back panel of the aviaries, where the nesting birds are less likely to be disturbed by the daily husbandry routines. The nest-boxes are hung on the outside and a hole cut through the wire allows the birds access to them. Each aviary has horizontal perches, the food and water area, a calcium block and a regular supply of fresh wood for the birds to chew.

The nest-boxes provided for the Red-browed Amazons measure approximately 70cm high x 30cm x 30cm (about 27 $\frac{1}{2}$ in high x 11 $\frac{3}{4}$ in x 11 $\frac{3}{4}$ in), not quite as high might be expected for a large Amazon parrot, but this is to prevent placing unnecessary weight on the structure of the suspended cages. The nest medium used is large-sized wood shavings. Clutches laid at Loro Parque between 1995 and 1997, always numbered three to five white eggs. The incubation period appears to be 25 days, but this still requires confirmation from a larger number of parent incubated eggs. To date the majority of eggs have been incubated by foster parents. Newly hatched

young have strands of yellow primary down on the back and nape, but otherwise are naked. All young parrots hatched at Loro Parque can be identified by a closed leg band fitted between the age of 14-21 days. When endangered species such as Red-browed Amazons have fledged and are independent, a second means of identification in the form of a numbered micro-chip is placed in the breast muscle.

Once fledged, all young Red-browed Amazons are placed in a large holding aviary measuring 12m x 1.5m x 2.5m (approx. 39ft x 5ft x 8ft) and live in a small flock and get lots of flying exercise during the first year of their lives. This we thought would produce birds in a stronger physical condition and provide them with better opportunities for juvenile social interaction, an important point in view of the fact that so many of them had been reared by foster parents.

The wild population of the Red-browed Amazon remains under threat, with large areas of its restricted range not protected from future land development. In Europe the future of the captive population now looks a little brighter. In addition to the success achieved at Loro Parque, Palmitos Park on Gran Canaria has also recently succeeded in breeding this species. A number of first generation young bred at Loro Parque have been transferred to create unrelated pairings of first generation offspring and several more of the founder birds at Loro Parque are showing signs of becoming reproductively active. Outside of Europe there are small populations of Red-browed Amazons in South Africa, Asia and North America. The North American population is now the subject of a SSP (Species Survival Plan) which is being successfully coordinated by Dr Paul Riello, with breeding having been achieved on several occasions at the Rare Species Conservatory. International cooperation and continuing improvements in the breeding success of the captive populations means things now look well placed to ensure a safe future for the Red-browed Amazon, in captivity, if not in the wild.

Roger G. Sweeney now works as an avicultural consultant, mainly in the Middle East and south-east Asia. His contact address is:- Dymocks Mill Cottage, Oldcastle, near Malpas, Cheshire SY14 7NE, England.

AVICULTURAL MAGAZINE BACK ISSUES

A large stock is available including some early issues. Sales are by post only. Further details are available from: - Hon. Secretary, Avicultural Society, c/o Bristol Zoological Gardens, Clifton, Bristol BS8 3HA, England.

COUNCIL MEETING

A Council Meeting was held on Saturday, April 17th at Linton, Cambs.

The following members were present: Miss R. Ezra (President), C.J.S. Marler, R.C.J. Sawyer (Vice Presidents), K.J. Lawrence (Chairman), M. Curzon, M. Ellis (Hon. Editor), Mrs. L. Gardner, R. Grantham, N. Hewton, Mrs. D. Holloway, R.E. Oxley, S. Pyper, J. Trollope, Dr R. Wilkinson, Ms. R. Wiseman, G.R. Greed (Hon. Secretary/Treasurer).

The Chairman welcomed Diana Holloway and Laura Gardner to their first Council Meeting. It was agreed to invite James M. Dolan, Jr., Ph.D. , Director of Collections at The Zoological Society of San Diego, and the Rev. Ramon Noegel, also in the USA, to become Vice Presidents of the Society (invitations that both were delighted to accept). N. Hewston, K.J. Lawrence, Dr R. Wilkinson and Ms. R. Wiseman were re-elected to the Council for a further period of five years.

The Hon. Editor reported that he had recently received several articles and hopes to be able to publish at least four issues of the magazine during the course of the year.

Membership at the end of 1998 was slightly up on the previous year. The Society again had a stand at the National Exhibition of Cage and Aviary Birds, at the NEC, Birmingham. This proved very popular and several new members were enrolled and some lapsed members renewed their subscriptions. Those running the stand were kept busy answering questions on many aspects of aviculture. Rosemary Wiseman, the stand coordinator, and her team were thanked for their hard work.

The Hon. Secretary/Treasurer reported that the Society is in a sound position financially and the subscription rates can safely remain unchanged. He took the opportunity to point out that he retires from Bristol Zoo in three years time and therefore the Society needs to think about finding a new home somewhere else. Geoffrey concluded by inviting the Society to visit Bristol Zoo during the year 2000.

Changes to the Rules recommended by the sub-committee appointed to simplify and update them, were accepted and passed, and will be published in a future issue of the magazine. However, the section relating to the Society's Awards was put on hold pending further research into the history of some of them.

THE SOCIETY'S VISIT TO LINTON ZOO

by Stewart Pyper

Following lunch at a local pub, members and their guests visited Linton Zoo. The zoo has been developed by the Simmonds family and is well known for its breeding programmes. It was our first visit and members and their guests were very impressed with everything on view.

The collection includes members of the Cat family, tortoises and birds. The aviaries are generally large, well constructed and attractively planted. An aviary 100ft x 30ft x 27ft (approx. 30.4m x 9.1m x 8.2m) to the apex of the roof, houses Trumpeter Hornbills and Green-crested Touracos, along with Lilac-breasted Rollers, which are able to fly the length of the aviary and make a wonderful sight. It also houses a breeding pair of Southern Ground Hornbills, which during our visit remained in the shelter, as the female was sitting. A young Linton-bred Southern Ground Hornbill, which is very tame and likes to play with a small ball, lives on its own in another aviary. There is also a magnificent pair of Blyth's Hornbills which hatched chicks in 1998, but failed to rear them, and Kim Simmonds is hoping that they will go a stage further this year. Their aviary is one of many that has a system installed to enable a light spray of water to be used to try to help stimulate the birds into breeding activity.

A large landscaped aviary with a waterfall is occupied by among others, Blacksmith Plovers, Hammerkop and Hadada Ibis. The Toco Toucan bred at Linton Zoo, for which the zoo shares the UK first breeding award (1989) remains on view, together with one of its remaining parents, which is now looking rather old. We saw a lovely pair of San Blas Jays in an aviary next to that of a superb male Ross's Touraco, received recently on loan from Belfast Zoo. Linton has two females and a male will be introduced shortly. Among the parrots are a pair of Green-winged Macaws, Scarlet Macaws and Moluccan Cockatoos, and among the owls are the Northern Hawk Owl, Great Grey Owl, Turkmenian Eagle Owl and Malaysian Brown Owl. We also saw a nice breeding pair of Grey-necked Crowned Cranes.

Our thanks go to Len Simmonds and his daughter Kim for their hospitality, and to all the staff for making our visit so interesting and enjoyable.

NEWS & VIEWS

DUCORP'S COCKATOO BRED

The latest cutting from Robert Callaghan, again comes from the *Staffordshire Sentinel* and concerns Neal Hancock, a Hanley pet store owner, who has bred a Ducorp's Cockatoo *Cacatua ducorps*. It is said to be only the third to have ever been bred in the UK. Neal bought the parents four years ago and later sent them to an aviary in mid-Wales, where they laid an egg which hatched March 1st. The chick was hand-reared.

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CAPE YORK STUDY

Two of Australia's rarest finches, the white-bellied Crimson Finch *Neochmia phaeton* and the Cape York Peninsula population of the Star Finch *N. ruficauda*, are to be studied by Michael Todd, who will be working for the Queensland Department of Environment and Heritage.

The white-bellied Crimson Finch, which also occurs in southern New Guinea, appears to now be confined to two small populations on the west and east coasts of the Cape York Peninsula. The Star Finch, which until recently was a common species around the Gulf of Carpentaria, is now confined to the same two areas. Michael will study the habitat of these two species and how they use it throughout the year. He hopes to discover what they eat and when as the seasons progress. When the Cape York study is completed, it is hoped that he will be able to study the larger populations of these two species in the Northern Territory, as well as look at areas where they have disappeared, to try to discover what is missing.

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VO QUY'S PHEASANTS

Two male Vietnamese or Vo Quy's Pheasants *Lophura hatinensis* bred at Antwerp Zoo, Belgium, are now on display at the Cotswold Wildlife Park in Oxfordshire. It is hoped that both will be paired-up in time for next season as part of a European breeding programme. At the Cotswold Wildlife Park, where the collection includes White Eared Pheasants *Crossoptilon crossoptilon*, Himalayan Monals *Lophophorus impeyanus*, Siamese Firebacks *L. diardi*, Satyr and Temminck's Tragopans *Tragopan satyra* and *T. temminckii*, as well as Palawan and Grey Peacock Pheasants *Polyplectron emphanum* and *P. bicalcaratum*, they successfully breed Edwards' Pheasants *L. edwardsi* and hope to use similar methods to breed this new species.

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THREATENED VANUATU BIRDS

Each year Chester Zoo awards sums of money to students who are undertaking research work abroad that involves conservation programmes for endangered species. Among recent recipients was Gareth Douglas, who travelled to Vanuatu (which used to be called the New Hebrides).

Writing in Chester's *Zoo Life*, Summer 1999, he reports that of the seven endemic species found there, one, the Santo Mountain Starling *Aplonis santovestris* is confined to a small mountainous area on the island of Espiritu Santo. It was classified as vulnerable in the 1994 IUCN data list, as was the Vanuatu Kingfisher *Todirhamphus farquhari*. The Tanna Fruit Dove *Ptilinopus tannensis* is deemed to be near threatened.

With forest timber being sold off in order to fund a suitable infrastructure for this newly independent country, the main threat to the native birds is deforestation. A further threat is posed by introduced species, among them the House Sparrow *Passer domesticus* and the Common Myna *Acridotheres tristis*.

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A BLUE, BLUE ... BLUE YEAR

Earlier this year three Blue or Stanley Cranes *Anthropoides paradisea* were raised at Pretoria Zoo, South Africa, as part of the zoo's artificial insemination programme which started two years ago. South Africa's national bird has become a threatened species partly at least as a result of being persecuted by farmers, some of whom poison this beautiful bird. The chicks raised as part of the artificial insemination programme will be housed at the zoo or placed in breeding programmes elsewhere. On October 1st last year Pretoria Zoo celebrated the 99th anniversary of its founding and this October will host the 54th Annual World Zoo Conference.

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OWLS DOWN UNDER

The Australasian Raptor Association (ARA) is to present The Third International Symposium on the Biology, Conservation and Cultural Significance of Owls, January 19th-23rd 2000, at the Manning Clark Centre, Australian National University, Canberra. Further details are available from:- Owls 2000 International Symposium, c/- Conference Solutions, PO Box 238, Deakin West ACT 2600, Australia. Tel:02-6285-3000/Fax:02-6285-3001/E-mail:office@con-sol.com, or you can visit the Owls 2000 website at: <http://www.tasweb.com.au/owls2000/index.htm>.

* * *

BACK TO THE ISLANDS

According to the recently published *Zoological Society of London Annual Report* for last year, the flamingos - 37 Chilean *Phoenicopterus chilensis* - have been moved back to Three Island Pond, where the flock used to breed regularly, in the hope that this will re-stimulate breeding activity. The Eastern White Pelicans *Pelecanus onocrotalus* have also been moved to Three Island Pond and have been joined by eight Dalmatian Pelicans *P. crispus* from Villars-les-Dombes, France.

London Zoo's Red-crowned Cranes *Grus japonensis* hatched two chicks, but both died within two days from aspergillosis. Following the successful hand-rearing of a Superb Fruit Dove *Ptilinopus superb* (pp57-64), a Moluccan Cockatoo *Cacatua moluccensis* was hatched in an incubator and successfully reared using puppets to avoid the risk of imprinting. A pair of Red-tailed Amazons *Amazona brasiliensis* has been added to the collection. At Whipsnade the pair of Stanley Cranes *Anthropoides paradisea* produced four chicks from three clutches and a Brolga *G. rubicunda* was hatched following the use of artificial insemination. This pair had bred only twice previously in the last 20 years or so.

* * *

FURTHER SUCCESS

In 1997 five species of hornbill were bred at San Diego Zoo and San Diego Wild Animal Park (News & Views, Vol.104, No.2:93). In 1989 they did even better, between them they bred one Yellow-billed *Tockus flavirostris*, four Sulawesi *Penelopides exathatus sanfordi*, five Malaysian Wrinkled *Aceros corrugatus*, two Red-knobbed *A. cassidix*, one Papuan *A. plicatus jungei*, one Black *Anthracoceros malayanus*, two Silver-cheeked *Ceratogymna* or *Bycanistes brevis*, one Javan Rhinoceros Hornbill *Buceros rhinoceros silvestris* and one Great (Indian) Hornbill *B. bicornis*.

The two collections also did well with pigeons and doves, breeding one Pink-necked *Ptilinopus porphyrea*, one Yellow-breasted *P. occipitalis*, two Pink-spotted *P. perlatus*, one Lilac-capped *P. coronulatus trigeminus*, three Beautiful *P. pulchellus* and four Orange-breasted Fruit Doves *P. iozonus humeralis*, as well as one Grey-necked *Ducula caroli*, two Purple-tailed *D. rufigaster*, one Black-collared *D. mullerii* and three Green Imperial Pigeons *D. aenea paulina*.

Other birds bred during 1998 included 12 Collared Lory *Phigys solitarius*, 13 Blue-crowned Lory *Vini australis*, two Double-eyed Fig Parrots *Opopsitta diophthalma*, eight Cuban Amazons *Amazona leucocephala* and four Superb Birds of Paradise *Lophorina superba feminina* at San Diego Zoo and two White-bearded Manakins *Manacus manacus* at the Wild Animal Park.

TWO FIRSTS

Two Great Blue Touracos *Corythaeola cristata* have been bred at the Old House Bird Gardens, near Reading, Berkshire and two Red-billed Toucans *Ramphastos tucanus* on an industrial estate in Hertfordshire. Both are believed to be first UK breedings. The Great Blue Touracos may be the first ever bred in captivity.

* * *

A GRIEVOUS BLOW

What was said to have been the largest group of captive breeding Cape Parrots *Poicephalus robustus robustus* suffered a grievous blow when 10 adults and 16 young had to be put down after they tested positive for beak and feather disease, leaving just five adults and three young that appeared to be unaffected.

Their owner, William Horsfield, who owns Amazona Bird Farm in Assagay, KwaZulu-Natal, has spent the past six years breeding Cape Parrots, one of South Africa's most endangered birds of which perhaps fewer than 1,000 survive in the wild. Reliant on *Podocarpus* spp., the dominant trees of the Afromontane forest for food and nest sites, it is the destruction and alteration of its forest habitats, the removal of birds from the wild for the cage bird trade, and the shooting of them by farmers, that are the major factors responsible for the decline of this species. Two of William Horsfield's birds were rescued by him after they had been shot by a pecan farmer, when they raided his crop.

The African Parrot Research Unit at the University of Natal, Pietermaritzburg is conducting research on the Cape Parrot and this virus. Anyone able to provide information or who would like to make a donation towards the work should contact Dr Colleen Downs (Tel: (0331) 260-5104 within South Africa, or +27 331 260-5104 from outside South Africa).

* * *

FALLING PARROT NUMBERS

In 1988, 43,132 parrots were imported into the UK, but according to figures published recently, by 1997 the number imported fell to 5,500. Some 4,217 African Greys *Psittacus erithacus* were imported in 1988, but by 1997 the number had fallen to 297. Similarly, the number of *P. e. timneh* imported fell from 852 in 1988, to just five in 1997. The 1998 figures are not yet available, but are likely to show a further fall in the number of parrots imported.

* * *

BEST RESULTS FOR SIXTEEN YEARS

Nick Lindsay, Curator at Whipsnade Wild Animal Park, who wrote about Flamingos at Whipsnade (*Avicultural Magazine*, 104,3:100-101), has written to say that the park has had its best results for 16 years, with seven Caribbean Flamingos *Phoenicopterus ruber ruber* being hatched from 11 eggs.

* * *

AND THE FIRST TIME IN TWELVE YEARS

An Andean Flamingo *Phoenicoparrus andinus* chick has been hatched at the Wildfowl & Wetland Trust, Slimbridge, Gloucestershire. It is the first to be hatched there since 1987. The only collection to breed this species, the rarest of the flamingos, it has a flock of 38 and believes this latest success may be the result of raising the water level, which produced more mud for nest building. At the time of writing, three other eggs were still being incubated.

* * *

THE PLIGHT OF THE CHOUGH

The RSPB (Royal Society for the Protection of Birds) has launched an appeal to help save the Chough *Pyrrhonorax pyrrhonorax pyrrhonorax* - the subject of two recent articles in the magazine (*Avicultural Magazine*, 97,2:50-58 & 102,3:117-120) and said to be the bird that King Arthur's spirit entered after his death.

The latest figures suggest that there are now only 250 pairs in Britain, with a further 86 pairs on the Isle of Man. On the Hebridean island of Isla, once a stronghold of the Chough, the number is said, to have nearly halved in the past 12 years, and in Northern Ireland only two pairs remain. Peter Newberry, RSPB Species Policy Officer, has been quoted as saying, 'Our long term goal is to see Choughs return to their haunts along the south-west coast, particularly Cornwall, where it is part of local legend.'

Staff at Paradise Park, at Hayle, have been experimenting with fixing tiny radio transmitters to Choughs, in preparation for releasing aviary-bred birds, in an attempt to re-establish this species in Cornwall. Two have been bred this year in the Cobham aviaries of Avicultural Society President, Miss Ruth Ezra, and Vice President, Raymond Sawyer. *The Zoological Society Of San Diego, 1998 Physical Inventory* shows that San Diego Zoo acquired nine Central Asian Red-billed Choughs *P. p. centralis* in 1998, one of which died later that year.

* * *

BERTRAM E. SMYTHIES 1912-1999

Bertram E. Smythies, author of *The Birds of Burma* and *The Birds of Borneo*, died June 27th, aged 86. *The Birds of Burma* was written while he was working for the Burmese Forest Service, which he joined in 1934. Following Burma's independence in 1948, he joined the Forest Service of Sarawak, which led to him writing *The Birds of Borneo*. He was also the author of *Sarawak Forest Trees* and a co-author of *Flowers of South-West Europe*, illustrated by his wife, Jill, whom he married in 1964, shortly before retiring from the Forest Service and settling in southern Spain.

AN INVITATION TO THE ROYAL COLLEGE

The Royal College of Surgeons of England is keen to attract more visitors to its world famous Hunterian Museum at 35-43 Lincoln's Inn Fields, London WC2A 3PN. It also wants to make its unique collections of preserved material - human, animal and plant - more accessible to scientists from a wide range of disciplines and others who are interested. The museum houses a vast array of vertebrate and invertebrate animal specimens, some depicting normal anatomy and function, others illustrating infectious disease, developmental abnormality, neoplasia, regeneration and repair. The college also houses the odontological Museum and the Osman Hill Collection of primatological and other zoological material.

The Hunterian Museum is open weekdays and no formal appointment is needed. You can get further information by telephoning 0171 405 3474 (the number for the museum) or by contacting Prof. John E. Cooper, FRCPath, FRCVS, Wildlife Health Services, P.O. Box 153, Wellingborough, Northants NN8 2ZA, England. Tel: +44-(70 630241/ E-mail: NGAGi@compuserve.com.

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ADDRESS OF THE EDITOR

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SOME NOTES ON THE PIPING HORNBILLS AT GUINATE TROPICAL PARK, LANZAROTE

by Andrés Marín and Ana Matesanz

The Piping Hornbill *Ceratogymna* or *Bycanistes fistulator* is an African species which ranges from Senegal (south of Gambia), Guinea-Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo and Benin to Nigeria west of the Niger River, in the case of the nominate form *C. f. fistulator*. There are two races, *C. f. sharpii* and *C. f. duboisi* found to the east of the Niger River, the latter of which ranges eastwards to western Uganda.

From Alan Kemp's (1995) book on hornbills, we know that this species inhabits forest lowlands, palm oil plantations, mangroves and forested savanna. Large flocks are unusual, with group of two or three birds being more common. They group together to roost, but at sunrise disperse again. They are basically frugivorous, but sometimes catch flying ants. Sweet corn and some types of greenfood are also taken. The breeding season varies from region to region and may extend from October-December or January-February, with some records for July.

The Piping Hornbill is common in the wild, but is rare in aviculture. David Hancock, who is undertaking a census of such birds, and Koen Brouwer, Chairman of the European EEP, could find no records of other captive pairs of this species. Koen Brouwer did, however, come up with a record of one which lived for eight years¹ in the early 1990s. Its rarity in aviculture encouraged us to obtain a pair, not because of the possibility of holding the only captive pair, but because of the wonderful opportunity to learn more about this fairly small hornbill, about which there is a lack of knowledge. The Piping Hornbill has few evident charms, its bill lacks a big casque like other *Ceratogymna* hornbills and the bright colours of some of the *Tockus* species and this, in our view, accounts for its rarity in aviculture. Our pair came from a dealer in Belgium. We had no previous interest in this species, but when the two birds were offered to us, decided to buy the pair. In June 1998, we were told that a Spanish dealer had one for sale, but could find out no more about it.

Character and Behaviour

When our Piping Hornbills arrived in December 1996, their feathers were badly damaged but their general health seemed good. It was surprising to us to see how when they were nervous or excited, each of them raised the feathers of the nape, so that the nape appeared to be twice its normal size. A lot of care had to be taken when entering their aviary, as they were very nervous and flew about in a panic and we were fearful they might injure themselves. Over two years later they are still easily frightened and do not seem to have become accustomed to their keeper. However, it has been noticed how when they hear the sound of the cart carrying the food dishes, they watch everything with interest as they wait for the moment when their aviary door is opened and their dish of food is placed in the aviary.



The male and female together

The pair have learnt to tolerate the presence of visitors and look alert only when they recognise someone. I (A.M.) am charged with their management and special care and any changes that may be necessary, but have a problem making notes about them, as if they see me and feel that I

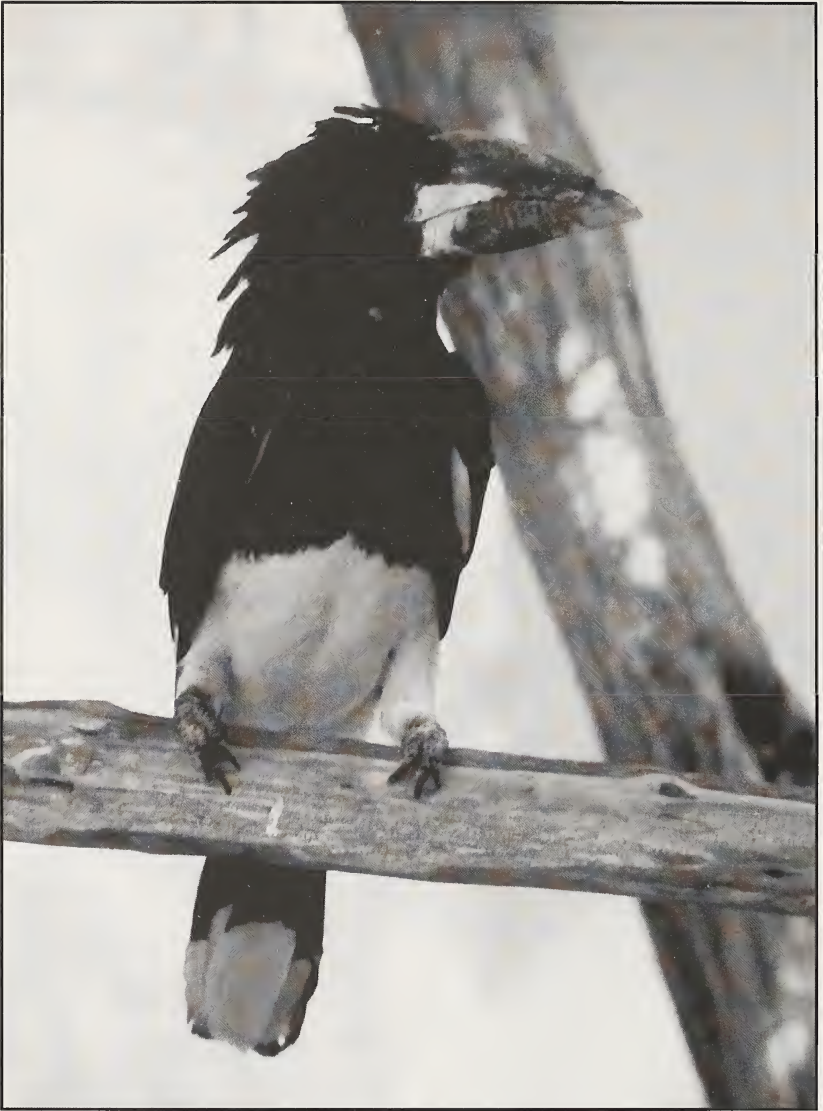
am too close, suddenly become very alert; they raise their feathers and fly to the opposite side of the aviary and the male jumps over the female (perched and alert too), landing on the other side of her. Therefore, it has been difficult for me to make any direct observations on changes in their behaviour. I use a portable video camera when the park is closed (I hope we will soon have a small camera in the aviary), but the views are not always perfect. When they have been feeling safe and secure, I have in this way been able to discover a little about their activities and make some notes about them; for example, the pair like to sunbathe, but have never been seen to open their wings like some other hornbills and never go down on to the ground like some Asiatic species. They have never been seen bathing and do not seem to enjoy sitting out in the rain like, for example, the Trumpeter Hornbills *C. bucinator*. The most exposed perches are favoured by the male and the female, which spend a lot of time preening themselves and always remain very close to one another.

Diet

On arriving they were given the standard diet for big hornbills in the park here at Guinate (see Appendix 1). At first only the grapes and soaked sultanas were eaten, then step by step they got into the habit of eating the other items as well. We have read that they eat berries in the wild, but our pair reject these. Sometimes we offer them *Tenebrium* sp and *Zophoba* sp. but they never seem very interested in these. They enjoy the minced meat which is offered twice a week. We give them sweet corn and chopped endive (as greenfood) and they especially like the latter. The approximate weight of food offered daily is 350g.

Housing

After a quarantine period of two months, the hornbills were placed in their permanent aviary which measures 4m x 4m x 2.5m high (approx. 13ft x 13ft x 8ft high). One side of the aviary is only half open to the public gaze to give these shy birds a more secure feeling. The nest-box was placed in this partly concealed area, but it was 10 days before the birds inspected it. At first the aviary was not as good as it might have been. At the time all of the park was undergoing radical improvements and our knowledge of these birds was not very good. There were not many perches or plants in the aviary, although there was a tree (*Cassia* sp.) growing in it. As it is impossible to find big tree trunks on Lanzarote, a wooden nest-box was made and covered with bark and branches, to make it look as natural as possible. It was an upright structure, with a square base and was about 2m (approx. 6ft 7in) high with an oval hole cut in the front about 1.5m (approx. 5ft) up from the floor. The hole allowed the birds access to the nest cavity, which was



Male Piping Hornbill

calculated to be about the size required by such birds and similar to that provided for other species. Concealed beneath it was a large bowl of water to help maintain the humidity in the nest-box, even on the driest days (on Lanzarote we get the Sirocco wind). The pair played at the entrance and even went inside to inspect the 'nest' but made no real attempt to seal the entrance hole.

In the summer of 1998 we made some improvements to the aviary. We provided some rocks along the most exposed side, planted some small and medium-sized shrubs, and provided a variety of natural branches for perching. In addition, the original nest-box was replaced by a convenient sized barrel, concealed by wicker screening. When the changes were completed, the birds were reintroduced in to the aviary and after a matter of minutes seemed even happier than before and behaved as so they had never been away. However, it was some hours before they visited the nesting area, which they use now as a shelter when they want to feel safe.

Breeding Behaviour

We have been unable to find any references to visual evidence of when this species is in breeding condition (similar to the colour change around the eyes of the Trumpeter Hornbill and the blue colour on the throats of some Asiatic species). Our only guide has been the sight of the male offering food to the female and her frequent visits to the nest-box (both the new one and the old one). However, we believe that, as with pairs of other species, such behaviour may not necessarily indicate an interest in breeding, but merely be a way of reinforcing the pair bond. We provided them with a large tray of our nest-sealing mixture (see Appendix II). This mixture has been well accepted and used by other African hornbills such as the Trumpeter and the Red-billed species *Tockus erythrorhynchus*, but the Piping Hornbills have so far shown no interest in it.

In November 1998, after a brief display together, a possible copulation was observed. Because the birds were partly hidden by a branch, we did not have a clear view, and so cannot be sure! The birds moved together along the branch with their wings open and the head feathers slightly raised. However, no further displays or interest in the nest were observed during the following days.

Conclusions

The pair now seem well accustomed to life in captivity in their re-designed aviary. They remain quite active and healthy, and their plumage has a nice gloss to it. No problems have been detected with their standard diet. I (A.M.) believe that the amount of space they have and their need to feel secure are very important.

They like to spend the warmest hours of the day sheltering from the sun. As the collection is housed on one of the Canary Islands, close to the coast of Africa, we are unable to say how they would tolerate cold weather. Here, the warm, dry weather is not a problem so long as they have sufficient shade. The lowest temperature recorded at Guinate during the winter is 10°C (50°F).

If we succeed in breeding this species it could be important, for as with other aspects of this hornbill's behaviour, very little has been recorded about its breeding cycle.

APPENDIX I

Piping Hornbill diet at Guinate Tropical Park

Mixed fruits (apple, melon, papaya, grapes, banana, tomato, soaked sultanas, wild berries and other sweet fruits when in season) cut into pieces

Boiled potato cut into pieces

Soaked dog chow (Eukanuba)

Pellets for frugivorous birds (Zeigler)

Insectivorous dry food (Zeigler) mixed with the fruit

Grated carrot (also mixed with the fruit)

Sweet corn

Chopped endive

Minced meat (twice weekly). As their preferred food it is used to help administer dietary supplements and medicines.

APPENDIX II

Mixture provided for sealing the nest hole

One part sphagnum moss

One part horse manure

One part clay

All three items are mixed with a small quantity of water into a muddy consistency and maintained like this by adding more water if necessary.

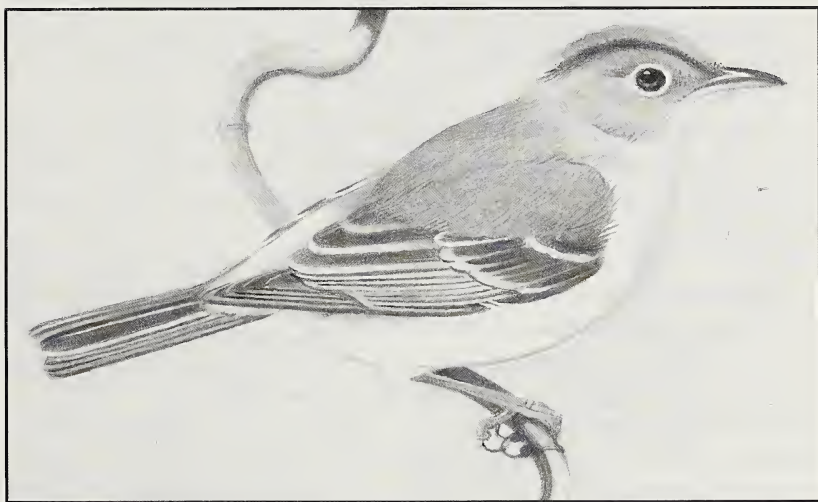
Andrés Marín and Ana Matesanz are the Curators of Guinate Tropical Park, Lanzarote, Canary Islands, Spain. Andrés is especially interested in hornbills and touracos.

¹ *When I started working in the Bird House at London Zoo in January 1956, among the first birds I looked after was a Piping Hornbill. According to the label on the aviary, the bird had arrived at the zoo in 1946, from the Gold Coast (now Ghana). However, Senior Curator, Simon Tonge, has checked the zoo records and according to them, the bird which arrived in 1946, was sent to Moscow Zoo in 1948. A second arrived in May 1951, probably from Sierra Leone, and died in January 1960 of arterial sclerosis, so lived there for approximately eight years nine months. These were the only two Piping Hornbills which have ever been kept at London Zoo - Ed.*

FLYCATCHER WARBLERS

by Frank Woolham

The seven species of flycatcher warblers, genus *Seicercus*, appear to be little known in aviculture. A further four species form the genus *Abroscopus*. All are closely related to the *Phylloscopus* warblers and kinglets (*Regulus*). A small number of Chestnut-headed Flycatcher Warblers *S. castaneiceps* were offered for sale in Britain during 1996 and I was able to obtain four examples. More recently others are reported to have been available in Europe, including the Black-faced Flycatcher Warbler *A. schisticeps*.



Malcolm Ellis

Chestnut-headed Flycatcher Warbler

The Chestnut-headed Flycatcher Warbler measures 4in (10cm) in length. The crown is chestnut, with a blackish streak extending from the base of the bill to the sides of the nape; the sides of the head are grey and there is a narrow white eye-ring. The remainder of the upper surfaces grey to grey-olive; the two wing bars are yellow and the rump and upper tail-coverts are also yellow. The tail is dark brown. The underparts are grey-white, with some yellow on the flanks. The sexes look similar.

The seven races range over an area extending from Tibet and Nepal to Burma, southern China, Thailand, Laos, Vietnam, Malaysia and Sumatra. Typical habitat includes forest, forest undergrowth, etc. In habits they are said to resemble leaf warblers and outside the breeding season are frequently found in company with these and other small insectivores.

All four birds were housed together in an indoor flight measuring 6ft x 2ft 6in x 1ft 8in deep (183cm x 76cm x 51cm deep). Furnishings consisted of natural (willow) branches - providing both horizontal perching and two or three more shrubby sections which, although initially treated with suspicion, eventually provided the means for a good deal of activity. They were immediately at home, although hyperactive and almost constantly on the move.

Bearing in mind their affinity with highly insectivorous species ranging from the Willow Warbler *P. trochilus* to the Goldcrest *R. regulus*, when they arrived I noted their slender, insect-eater's bill with some apprehension - and wondered what problems with their diet might lie ahead. As things turned out, there was no cause for apprehension and although appropriate livefoods were always provided I was astonished to see all four flycatcher warblers invariably showing an initial preference for the inanimate mixture in their feeding dishes.

Their staple diet consisted of a proprietary insectivorous mixture (initially Haith's Prosecto, subsequently Claus Fat Food, Type IV Blue); a similar selection of additives was added to each of these foods in the following proportions:

- 200g proprietary insectivorous mixture
- 10g grated cheese
- 10g grated whole prawn or fish roe
- 10g grated raw carrot
- 20g pounded hard-boiled egg

The mixture was made fresh each morning and fed twice daily. A supply of cheese was dried on paper towels for a couple of days (to reduce oil content) before being used. Prawns/fish roe were grated from frozen (for convenience). Eggs were blended into the mixture minus the shells. Vitamins/minerals, etc were not added to this diet.

I do not use standard-size mealworms for small insectivorous species since such birds often have difficulty digesting the tough cuticles. Mini mealworms are a better proposition, but even with these smaller larvae I prefer, whenever possible, to sift out those which are newly skinned. It is possible to keep an adequate supply going by investing in a quantity of mini mealworms and keeping them well fed (bran or one of the specially formulated diets) so growth is rapid and skin changes frequent. Waxworms were also provided at a rate of about half-a-dozen (six) per bird each day - as were crickets, although only on an occasional basis. The quick-moving flycatcher warblers had no difficulty capturing any which escaped from the container.

There were no aggressive interactions among the four birds, although mutual preening sessions eventually led to slight feather-plucking problems. Although in no sense noisy, they called frequently and I have referred elsewhere to their contact vocalisations sounding similar to those produced by foraging groups of *Aegithalos* tits.

In addition to the Chestnut-headed Flycatcher Warbler, the other species in the group are the Yellow-eyed Flycatcher Warbler *S. burkii*, Grey-headed Flycatcher Warbler *S. xanthoschista*, Allied Flycatcher Warbler *S. affinis*, Yellow-breasted Flycatcher Warbler *S. montis*, Grey-cheeked Flycatcher Warbler *S. poliogenys* and Sunda Flycatcher Warbler *S. grammiceps*.

Together with the aforementioned Black-faced Flycatcher Warbler, three other species make up the genus *Abroscopus* - the Yellow-bellied Flycatcher Warbler *A. supercilialis*, Broad-billed Flycatcher Warbler *A. hodgsoni* and White-throated Flycatcher Warbler *A. albogularis*.

Most authorities agree that, in the wild, these birds are almost exclusively insectivorous although it is possible some small berries may be consumed; those in my possession eventually took modest quantities of fresh (or frozen) elderberries, provided they were completely ripe, but were disinterested in any other kinds.

The *Seicercus* flycatcher warblers build domed or globular nests of plant fibres and moss with a softer lining. The eggs are white. Smythies *The Birds of Burma*, refers to a nest of the Yellow-bellied Flycatcher Warbler, discovered in Tenasserim some years ago, which was described as '...built in a dead bamboo, and consisting of a pad of felted green moss'. The eggs, 3-5 in number were described as '...white in ground-colour, either boldly spotted or minutely spotted with reddish-brown.' In the same work, the Black-faced Flycatcher Warbler is said to nest in bamboos or holes in trees.

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BREEDING THE WHISKERED LORIKEET

by Irene and Don Bardgett

We purchased a pair of recently imported Whiskered Lorikeets *Oreopsittacus arfaki* from a Lancashire bird dealer in October 1997. When we first saw them we were immediately impressed with their small size for as well as measuring only some 6in (15cm) in length, they are also very slightly built. Rosemary Low describes them as '...undoubtedly among the most difficult small parrots in aviculture', a description with which we would not disagree except to suggest that, in the wild, they must be more robust than they look for their alternative name is Arfak Alpine Lorikeet and they have been recorded at altitudes of up to 12,000ft (3,600m) in the mountains of New Guinea.

Despite searching diligently through as much avicultural literature as we could lay our hands on, we could find little in print about the species in the weeks immediately following their arrival. However, in January 1998, Rosemary Low, perhaps prompted by the previous year's importation, contributed some very useful notes in an article which appeared in the UK weekly publication *Cage & Aviary Birds*.

We housed the lorikeets in an all wire-cage measuring some 36in x 12in x 12in (91.5cm x 30.5cm x 30.5cm) in which we have previously bred various other small lorikeets, together with Vernal *Loriculus vernalis* and Blue-crowned Hanging Parrots *L. galgulus*. At first both birds were inclined to panic and take flight at the slightest provocation. However, they eventually settled down and were subsequently much less nervous. They were fed on the same Wysoy-based nectar mixture which we use for all our brush-tongued parrots. The mixture also includes brewer's yeast, bee pollen, white sugar and Farex. They also enjoyed sponge cake soaked in nectar but showed no interest in fruit. We had been told they like greenfood but the birds did no more than nibble at any of a variety of items they were offered.

Nearly eight months passed before we were provided with irrefutable evidence the pair might be in or approaching breeding condition. Because of their extreme nervousness, they had been provided with a nest-box from the time we brought them home. It was used for roosting and was obviously a welcome refuge for whenever they felt threatened they would both dive - literally - headlong through the entrance hole and remain hidden until they deemed it safe to emerge. Because we had not seen evidence of display or other courtship interactions between the pair it came as something of a surprise when we found a single white egg in the nest-box on May 15th, 1998. We felt it would be unwise to further disturb the birds and left them to their own devices.

On June 10th we heard what we believed to be a chick calling in the box. We discovered that two eggs had been laid and the second hatched on June 12th. Unfortunately both nestlings died, the second of them on July 4th. We had formed the opinion that the first of them may have been weak on hatching but the loss of its sibling, when three weeks old, was disappointing. On examination we found the dead youngster had food in its crop but the tiny carcase looked peculiarly flattened. Two further eggs were laid (on July 31st and August 2nd) but both were clear. We decided to seek advice from lory and lorikeet expert, Trevor Buckell to see if he could offer any explanation for the problem. Although he had no direct experience with Whiskered Lorikeets he suggested we changed the diet to NektarPlus which he pointed out, is of a thinner consistency to our mixture. We made the change gradually and experienced no further problems.

On October 2nd 1998 another egg was laid and a second followed within 24 hours. Both adults incubated and during this period we saw the male displaying for the first time. Most of this activity consisted of rapid head-bobbing which we likened to the kind of display performed by iguanas. After each display the male retired into the nest-box.

So far as we are aware, both eggs hatched on October 24th - an incubation period of 23 days. For several days after incubation the adults were extremely nervous and frequently behaved in a very agitated manner - to such an extent that we considered moving items of equipment away from the vicinity of their cage in case the problem was associated with the environment immediately outside their accommodation. However, they eventually regained their composure and no further problems ensued during the nestling period.

The first chick emerged from the nest-box after 45 days, the second young bird fledged the following day. At this time the adults again became nervous, but their offspring conducted themselves with remarkable confidence and began feeding almost at once. Within three weeks they were obviously independent and we separated them from their parents. The decision had nothing to do with parental aggression. Indeed although the female was again showing interest in the nest-box all four birds frequently engaged in mutual preening.

In marked contrast to the adult birds, the chicks, initially, had shown every sign of confidence. Soon after fledging they hopped onto a proffered hand in their cage without the slightest sign of fear, even when gently stroked. When housed alone following independence they spent a good deal of time playing together when they would roll about like kittens engaged in mock fights. However, after being transferred to more spacious quarters their willingness to engage in close contact with their owners rapidly diminished!



Rosemary Low

Whiskered Lorikeets in the aviaries of Fred Barnicoat in South Africa

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Colin Smale

The two Whiskered Lorikeets bred by Irene and Don Bardgett. The birds are still in juvenile plumage.

Irene and Don Bardgett live in Shipley, West Yorkshire. Lifelong foreign bird enthusiasts, they keep a variety of species ranging from small seedeaters and softbills to lorikeets.

When I wrote to Rosemary Low, an acknowledged expert on the lories and lorikeets and the author of the Encyclopedia of the Lories, to ask if she had a photo of the Whiskered Lorikeet that could be used to illustrate the previous breeding account, I suggested she might like to summarize what is known about keeping this species. This is what Rosemary wrote:-

WHISKERED LORIKEETS NEED SPECIAL CARE

by Rosemary Low

Three years ago at least two importers in the UK were offering Whiskered Lorikeets *Oreopsittacus arfaki* for sale. This is the smallest and, in some ways, the most delicate of the lorikeets which have been imported. It is an exquisite little creature but suitable only for highly experienced lorikeet keepers who can devote much time to its care and who have exactly the right accommodation. For more than a decade attempts have been made to import this lorikeet into Europe; losses in transit and in quarantine have, unfortunately, been very high although the numbers of birds involved have been small. It was therefore with very mixed feelings that I discovered that further attempts have been made.

I sincerely hope it does not lead to a demand for what is undoubtedly one of the most difficult small parrots in aviculture. I especially hope that exhibitors are not tempted to buy the species. It is not a bird which takes kindly to the stress of being caught up and moved around for shows. In addition, unless the diet and conditions are exactly right, the plumage lacks lustre and may have unsightly dark marks.

The two main problems with newly imported birds are the diet and the reluctance to bathe, or possibly lack of suitable bathing facilities. This may lead to the plumage becoming sticky. The Whiskered Lorikeet is a tiny little creature, more finch-like than parrot-like, and weighs about 21g.

If its plumage is in poor condition, it will quickly lose body heat and will become inactive and unhappy. In good health the Whiskered is active and vivacious in the extreme - a joy to behold. A friend in South Africa has told me about the losses of newly imported birds there. They were kept in conditions under which the plumage became sticky and the birds lost their ability to fly.

Knowledge of the specialised dietary requirements of this species is vital. One importer told me that they refused nectar. This was probably because the nectar offered was too thick. It must be thin, more like that offered to a sunbird. He had been feeding them on tinned fruit cocktail. On this diet they would be unable to moult or to breed, because it contains no protein. A properly formulated lorikeet food is essential for long-term survival.

In Germany Nekton-Produkte has produced a nectar food for the small lorikeets. It is called NektarPlus and should be available from the Nekton distributor in the UK (Parlour Products, Farndon Road, Market Harborough, Leics. LE16 9NP).

The manufacturers state that they have bred Whiskered Lorikeets using this nectar only, which was originally formulated for hummingbirds and sunbirds. It is quite expensive but when a correctly balanced diet is offered, the quantity consumed will be less than on a homemade diet. The latter is unlikely to be balanced for the needs of the species, thus the birds need to drink much more to obtain the vital nutrients.

To my knowledge, worldwide there are only two aviculturists who have been successful in breeding this species on a continuing basis. One of these is Ruediger Neff in Germany, an exceptional aviculturist who specialises in lorikeets. He told me that the liquid food for this species must contain a higher proportion of glucose (dextrose), similar to that used for hummingbirds. He also offers daily a dry food. He mixes the following to make 1 kilo: 430g ground bee pollen, 360g oat cereal, 140g glucose, 50g of brewer's yeast and 20g of a calcium and mineral supplement. Another very important element of the diet is greenfood. He attaches fresh chickweed to the twigs of a branch twice daily. The Whiskered Lorikeets eagerly consume the seed capsules and the green leaves. Without it, their plumage is dull and the birds are less active. Drinking water for this species, and all other lorikeets is essential - despite what has been published elsewhere.

When established, Whiskered Lorikeets are quite hardy; they are mountain birds. But on release from quarantine they would need to be kept in heated accommodation right through the winter and spring. In the summer they are best kept in a spacious planted aviary; they will live amicably with finches. As in the small *Charmosyna* lorikeets to which they are closely related, their metabolic rate is high. Their rate of respiration, is noticeably fast and they quickly become ill if they are cold or hungry. They must always have food in front of them; in the winter months the daylight hours must be extended with artificial light. They need to feed frequently. They also need bathing facilities on a daily basis. They are extraordinarily enthusiastic bathers!

The Whiskered Lorikeet is sexually dimorphic. Young birds can be sexed by the age of four months. The female lacks the scarlet forehead and crown.

I have had the pleasure of observing this enchanting little bird in the highlands of New Guinea. I have to admit that I believe this is where it belongs because there are not enough truly dedicated breeders like Ruediger Neff who will go to endless trouble to ensure that it is correctly cared for.



Ruddy Duck drake in breeding plumage

Dieter Rinke



Black drake at Vogelpark Walsrode

Dieter Rinke

A BLACK STIFFTAIL DUCK AT VOGELPARK WALSRODE

by Dieter Rinke

In 1991, some North American Ruddy Ducks *Oxyura jamaicensis* bred at Vogelpark Walsrode and reared a number of ducklings. These developed normally and during the winter wore their species-specific first-winter plumage. After the spring moult, however, while all the other males attained their Ruddy Duck breeding plumage, one became completely black (see photo). Afterwards it moulted into an intermediate eclipse plumage, clearly showing the facial stripe characteristic of females. This sequence of events has continued each year up until the present time: in winter, the black drake shows male and female eclipse plumage traits, and in spring he moults into his black plumage. Only the centre of his belly is of lighter coloration, and the breast feathers show a pale scaly pattern. The bill is not as shiny as in normal coloured males, and has irregular black spotting.

From studying the available literature and interviewing experienced waterfowl breeders, it became clear that this phenomenon was previously unknown: no other similar case among Ruddy Ducks or related stiff-tail ducks has, to my knowledge, been recorded.

This black drake shares a pond with four other male North American Ruddy Ducks. While the latter display excessively, the black drake keeps out of these activities. He behaves more or less like a different species, or like a female, which tolerates copulations from the other four drakes. This seems to be rather common behaviour among ducks, with drakes copulating with females of other species in the absence of conspecific mates.

Is this just a mood of nature, perhaps a bird with suppressed male plumage in our all-male group, or is it a mutation? Does this exceptional plumage colour have a particular function? One could imagine perhaps that this black drake being camouflaged as a different 'species' has a greater chance to copulate unnoticed among the densely packed territories of dominant male Ruddy Ducks whereas a weak drake in normal plumage would hardly receive any attention from ready-to-mate females far away from the deciding courtship activities. This is though just an hypothesis. If it was a strategy to increase its genetic presence in the next generation, this phenomenon would be much more widespread in nature. There are, however, to the best of my knowledge, no observations to confirm this. Therefore, I would like to appeal to any members who know of any other black Ruddy Ducks, to contact me: - Dr Dieter Rinke, Curator, Vogelpark Walsrode, Zoologischer Garten, Am Rieselbach, Germany. Tel: (0 51 61) 2015 - 2017/Fax: (0 51 61) 82 10/E-mail: office@vogelpark-walsrode.de.

COMMONLY ENCOUNTERED HATCHING AND POST-HATCHING PROBLEMS IN BUSTARDS: RADIOGRAPHIC IMAGING, ENDOSCOPY, SURGICAL INTERVENTION AND POST-HATCHING CARE

by Tom Bailey and Susan Anderson

Summary

Selected case reports describe some of the common hatching and post-hatching problems that have been encountered with bustards at the National Avian Research Center in Abu Dhabi. The hatching parameters of bustards along with techniques to assist malpositioned embryos, including radiographic imaging, endoscopy and oviductomy are described. Standard treatments given to chicks with delayed or assisted hatchings and the correction of spraddle leg and umbilical protuberances are discussed.

Introduction

In recent years there has been a surge of interest in the propagation of bustards in captivity, in particular, the Houbara Bustard *Chlamydotis undulata*. Captive breeding and restoration programmes for this species have been established in the Middle East (Bailey et al. 1996). Similar programmes for other threatened species of bustards have been established in Europe (Grummt, 1979; Goriup, 1985, Osborne, 1985), Australia (White, 1985) and the former Soviet Union (Zubko, 1992; Sukhanov, 1992). These programmes aim to produce surplus birds for release into protected areas, to supplement declining wild populations. Larger Houbara Bustard projects plan to release between 500 and 1,000 birds a year. Morbidity and mortality of chicks are potential limiting factors to the success of these projects and maximising the numbers of chicks that hatch is clearly an important goal in the avicultural care of these species.

A variety of techniques can be used to assist an avian embryo that is having problems hatching, these include radiography, endoscopy and oviductomy (Ensley et al. 1994). Selected case reports are presented here to illustrate the range of hatching and post-hatching problems that have been seen in Kori *Ardeotis kori*, Rufous-crested *Eupodotis ruficrista*, Houbara and White-bellied Bustard *E. senegalensis* at the National Avian Research Center and we describe some of the methods that have been used to try to correct these problems. It would be pretentious to say that the way we do things is the right way so we have also included examples of failures as well as the successes. There is still a great deal to learn about the care and management of the bustard paediatric patient.

Materials and Methods

Incubation techniques

The cases described arose from eggs produced between 1994 and 1997 by captive bustards at the National Avian Research Center (NARC), Abu Dhabi, United Arab Emirates. The incubation techniques used at the NARC are fully described in Sleight and Samour (1996) and Tarr et al. (1996). Forced air incubators (Schumacher VOMO-1SB and Grumbach Compact S-84) were used to incubate the eggs. The standard setting used was 37.7°C (99.9°F) with a turning rate of one cycle per hour. Three machines were run at varying humidities, low (~30%), medium (~60%) and high (~90%). This enabled eggs to be moved between incubators in order to attain an overall weight loss through incubation of 15%-17.5% (Sleight and Samour, 1996). While eggs were being incubated they were inspected five times a day and relative humidities and temperatures were checked. Eggs were weighed every three days to determine weight loss and deviations from 15%-17.5% resulted in remedial action. Still air incubators (Brinsea Hatchmaker) were used for hatching and the standard setting was 37.7°C (99.9°F) with a relative humidity of 90%. When eggs were in the hatchers they were examined five times daily and temperatures and humidity were checked. Eggs were not turned during this phase. Once a chick had hatched it was transferred to a dryer (set at 35°C-36°C (95°F-96.8°F) and 40%-50% humidity) where it was left for two to four hours depending on the strength of the chick before it was transferred to the rearing unit.

The incubation parameters for Houbara *C. u. macqueenii*, Rufous-crested, Kori and White-bellied Bustards are listed in Tables 1 and 2. If bustard chicks greatly exceeded these pipping intervals, or were weak or not progressing properly radiography, endoscopy and oviductomy were used to determine the position and status of the embryo. Olsen and Duvall (1994) give a full account of the normal hatching process of the avian embryo.

Radiography

Radiographs were taken with portable/mobile X-ray equipment (Sovereign II, PLH Medical, Watford, Hertfordshire, UK) using screen films (SUPER HR-G, Fuji Photo Film Co., Japan). Average egg weights and the exposure settings used for different bustard species are listed in Table 3. Four radiographs were taken of each egg that was positioned with its long axis horizontal (Fig. 1). The egg was rotated through 90 degrees after each radiograph and the eggshell was marked one to four. Radiographs were developed using a manual system. Using this technique it was possible to identify radio-opaque structures including limb bones and the characteristic V-shaped mandible. From each series of radiographs it was possible to

determine in malpositioned embryos the position of the head from identification of the ventro-dorsal profile of the mandible (Fig. 1). Radiography was a particularly useful technique for investigating problems with Kori Bustard eggs which because of the thickness of the shell are harder to candle than other bustard eggs.

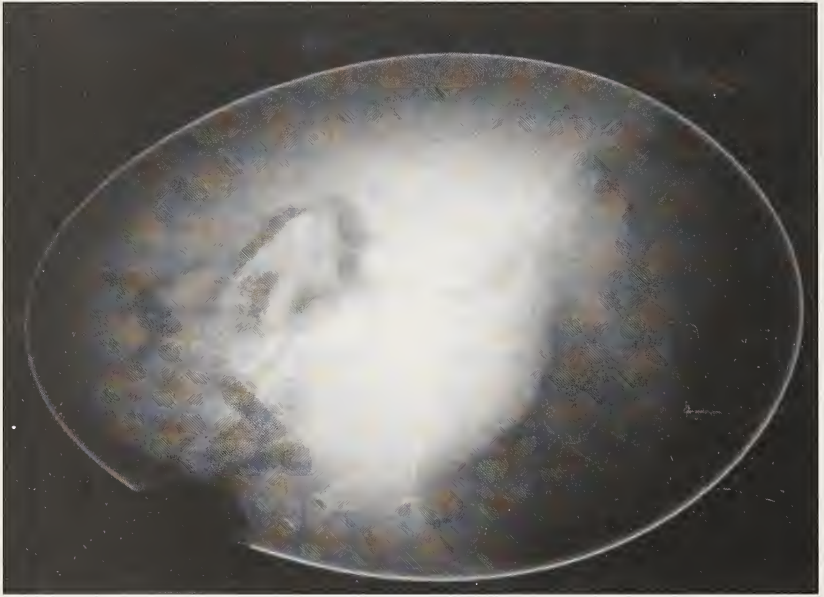


Figure 1. Radiograph of a malpositioned bustard chick (head in the small end of the egg). The outline of the mandible and the structures of the head are visible near to the hole that has been made in the shell

Endoscopy

In the larger eggs of the Kori Bustards it was possible to insert a rigid endoscope (4 mm, Richard Wolf, Mitcham, Surrey) through a hole made in the blunt end of the egg. The membrane was moistened with sterile saline and could be examined to determine embryo viability by monitoring respiratory movements. Use of the endoscope meant that the hole in the eggshell did not have to be made larger than necessary. If the chick was correctly positioned and/or no further immediate intervention was planned the hole in the egg was sealed using micropore tape (3M Medical-Surgical Division, St Paul, MN, USA).

Ovotomy

From examination of radiographs the position of the head and bill was established to determine the entry point for ovotomy. The shell over the entry point was cleaned using dilute iodine (Pevidine antiseptic solution,

B. K. Veterinary Products, Bury St. Edmunds, UK) and cotton wool moistened with surgical spirit. A small hole was made in the eggshell using the point of a No. 10 scalpel blade and small pieces of eggshell were gently removed using forceps. In the malpositioned embryos, because the entry site was away from the air cell, care had to be taken to examine the membrane for regression of the blood vessels. This was determined by moistening the membrane with sterile saline, which then became translucent. Regressing blood vessels took on a ghost-like appearance and were only partially filled with blood or had no blood in them at all. In all cases of malpositions described in this report there was minimal or no haemorrhage from blood vessels in the membrane. Pieces of eggshell and membrane were progressively removed until the head and/or bill were found. Once the chick was provided with a breathing hole it was left and checked every two to four hours when progressively more shell and membrane were removed until the chick was hatched. As more shell was removed the yolk sac was visually examined and chicks were left in the shell until it had fully retracted. Chicks were re-evaluated every two to six hours. If the yolk sac was still visible dilute iodine was dropped onto it with a moistened cotton bud.

Post-hatching care

All chicks with assisted hatches described in this report were given the following:

Application of 1% iodine solution to the umbilici of chicks promptly after hatching.

Administration of gentamicin (Cidomycin, Roussel Laboratories Ltd, Uxbridge, UK) at a dose of 5 mg/kg sid i.m. for 72 hours and s.c. (Duphalyte, Solvay Duphar Veterinary, Southampton, UK.) or p. o. electrolytes (Pedialyte, Abbott Laboratories, Chicago, USA) for 24-48 hours to chicks that had a delayed or assisted hatch.

Supplementation of the rearing diet with probiotics (Avipro, Vetark. Winchester, UK) from 0-14 days, one week before and after translocations between aviaries, and if birds are given antibiotics.

Case Reports

Hatching problems

Case 1 - White-bellied Bustard id 1178 'head in small end of shell'

This egg had been incubated for the first 18 days in a Shumacher incubator, and in a non-turning Grumbach incubator on days 18-20. The egg was candled on the fourth day and determined to be fertile. The weight loss of this egg had been considered normal (15%) and no problems had

been encountered during incubation (temperature, humidity, rolling).

On the 20th day it was placed in a Hatchmaker incubator. At 7.30am it was candled to determine whether it had internally pipped. No evidence of internal pip was observed by candling and at 10.00am the egg was radiographed to determine the position of the embryo. The radiograph showed that the bill was parallel to the short axis of the egg and midway between the air cell and the small end of the egg. A diagnosis of 'head in the small end' was made. At 11.30am a 10mm hole was made over the bill to enable the chick to breathe. Although blood vessels were not prominent, there was some oozing of blood that rapidly stopped after dabbing with the tip of a dry sterile cotton bud. The chick was alive, but it appeared to be weaker than when it was candled at 7.30pm. At 10.30pm the chick had moved its bill away from the hole and although there were no other changes, vocalisation sounds appeared to be stronger.

On the 21st day at 5.30am the chick had made an external pip crack beside the hole and the chick still sounded strong. At 4.30pm although some blood vessels were still prominent the hole was enlarged and the chick was given two drops of water orally. At 7.30pm examination of the membranes showed that the blood vessels had regressed fully and as the chick had made no progress on its own, more shell was removed and the chick was assisted out of the shell. The yolk sac was fully absorbed. The chick was given the standard post-hatching care. There were no further



Figure 2. Post-mortem examination of a malpositioned bustard chick (head in the small end of the shell)

problems with this chick which developed normally. Figures 1 and 2 show the radiographic and post-mortem findings of bustard chicks with this malposition.

Case 2 - Kori Bustard id 795 'foot over head'

This egg had been incubated under a broody bantam for the first 10 days. It was candled on the 10th day and determined to be fertile. From days 11-20 it was artificially incubated in a Shumacher incubator and on the 21st day it was placed in a non-turning Grumbach incubator. The weight loss of this egg had been considered to be normal (13%, low end of normal range) and no problems had been encountered during natural (broody bantam) and artificial incubation (temperature, humidity, rolling).

On the 22nd day there was no evidence that the chick had internally pipped and the chick was estimated to be 24 hours delayed in the hatching process. At 4.00pm radiographs were taken, but it was not possible to visualise any radio-opaque features that would help to establish the position of the head. A hole was made in the large end of the egg and endoscopy was performed which showed that the chick was still breathing and it could be heard vocalising. The hole was enlarged and the air cell membrane was opened. The bill was pointed to the side of the egg below the air cell and one foot was positioned over the head. The breathing was becoming irregular and vocalisations stopped, so more shell was removed and the head was freed. Visualisation of the yolk sac showed that it was not fully absorbed, so the body of the chick was left in the remains of the shell and it was replaced in the hatcher. The chick was checked at 7.00am the following day and the yolk sac was completely reabsorbed, but there was a small 5mm diameter stump of tissue projecting from the umbilicus. In this case the chick received the standard treatments for assisted hatch chicks. The stump was cleaned with dilute iodine and gentamicin ointment (Gental 0.1%, Sulphar, UAE) was applied three times a day. The chick developed normally and there were no further complications.

Case 3 - Kori Bustard egg id KB/AAZ/97/04 'head over right wing'

This egg had been incubated for the first 20 days in a Shumacher incubator, and in a non-turning Grumbach incubator on days 21-23. The egg was candled on the fourth day of incubation and determined to be fertile. The weight loss of this egg had been considered normal (between 13%-17%) and although no problems had been encountered during incubation concerning temperature and humidity, a problem with the turning in one of the incubators was suspected.

On the 24th day it was candled at 7.00am and the membrane at the air cell was observed to be moving and the embryo was thought to have internally

pipped. At 6.00pm the egg was recandled and submitted for radiography. The radiograph showed that the bill was positioned away from the air cell and the shell was opened over the air cell to determine whether the chick was still alive. No movement could be seen and the embryo was declared dead and submitted for post-mortem examination. This revealed that the head was over the right wing. Additional post-mortem findings included an incompletely absorbed yolk sac.

Case 4 - Rufous-crested Bustard egg id AAZ/RCB/97/38 'head between the thighs'

The female incubated this egg for the first three days and it was then placed in a Schumacher incubator for days 4-19, and in a non-turning Grumbach incubator on days 19-20. The egg was candled on the third day of incubation and determined to be fertile. The weight loss of this egg could not be determined because the fresh egg weight had not been recorded. No problems were encountered during incubation (temperature, humidity, rolling).

On the 19th day it was candled at 7.00am and appeared close to internally pipping with the embryo pushing against the internal air cell membrane which was observed to be moving. On the 20th day the egg was recandled because it had still not internally pipped. The air cell was drawn part-way down the length of the egg and it appeared that the body was pushed against the air cell rather than the head. It was submitted for radiography at 6.50pm. The radiograph showed that the head/bill was pointing away from the air cell. At 7.50pm the shell was opened over the air cell to determine whether the chick was still alive. The embryo was making vigorous movements. The radiograph was assessed to determine where to enter the egg and by 8.10pm after the ovotomy was started the chick's head was located but the chick was dead. The egg was submitted for post-mortem examination that revealed that the head was between the legs and the yolk sac was almost completely retracted.

Post-hatching problems

Case 5 - Houbara Bustard id 740 'incompletely absorbed yolk sac'

This chick was malpositioned (head in small end of shell). It had pipped from the small end by itself, but was unable to complete the hatching process on its own. It was successfully assisted without the need for radiography. On hatching the yolk sac was completely absorbed but there was a small remnant stump of umbilical tissue (Fig. 3 illustrates this in a Kori Bustard chick). This was cleaned with dilute iodine and ligated with 4/0 polygalactin 910 (Vicryl, Ethicon Ltd., Edinburgh, UK.) and gentamicin cream was



Figure 3. Umbilical stump remnant in a Kori Bustard chick

applied. The other standard treatments for assisted hatch chicks were given. There were no complications and the chick developed normally.

Case 6 - Rufous-crested Bustard id 269 'rolled toes at hatch'

This chick was positioned normally and hatched normally without assistance, but it was noticed to have rolled toes on hatching. The toes were taped with adhesive micropore tape, which was wrapped in such a fashion so that it pulled the toes in the opposite direction until the rotation was corrected. A cut shaft of a cotton bud was incorporated on the plantar surface of the foot. The tape was removed and replaced every two days and after a week no further treatment was necessary.

Case 7 - Rufous-crested Bustard id 650 'splayed legs at hatch'

This chick was positioned normally and hatched normally without assistance, but it was noticed to have splayed legs on hatching. The legs were hobbled with Vetwrap (3M Animal Care products, USA), tied on the middle part of the metatarsus and the chick was kept in a small plastic container padded with paper towels for two days. The chick recovered uneventfully and developed normally with no further complications.

Case 8 - Kori Bustard id 976 'yolk sac infection'

This chick was malpositioned and hatched with assistance. When there was no sign of internal pipping the egg was submitted for radiography. The radiograph showed that the bill of the embryo was away from the air cell. Endoscopy confirmed that the chick was still alive and ovotomy allowed the egg to be entered and to determine that this malposition was a 'head between the legs'. The shell around the head was removed, but it could be seen that the yolk sac was incompletely retracted and the chick was weak. The yolk sac was dabbed with dilute iodine, the chick was given an i.m. injection of gentamicin and s.c. electrolyte fluids and the body of the chick was then taped within the egg to encourage further retraction of the yolk sac. The chick was left in the egg for 24 hours, during which time it was given further fluids and gentamicin. The yolk sac was almost completely reabsorbed and on removal from the egg the remaining yolk sac was ligated with 4/0 polygalactin 910 according to the method of Heck and Konkel (1991). The chick appeared to be bright, but had splayed legs on the day after being freed from the shell. It was given its third and last injection of gentamicin and a single injection of 15mg long-acting amoxycillin (Clamoxyl LA, Smithkline Beecham, Surrey, UK) and the legs were hobbled. On the second day after being freed from the shell the chick was depressed and was dyspnoeic. Treatment with enrofloxacin was started but the chick died four hours later. Post-mortem examination was conducted. The blood vessels lining the yolk sac were congested and the yolk sac was distended with green-yellow contents. The lungs, liver and meningeal blood vessels were congested. A heavy growth of *Staphylococcus* spp. was cultured from yolk sac contents and liver samples.

Discussion

The individual cases described in this report cover a range of hatching and post-hatching problems observed in bustards at the NARC. Cases 3 and 4 demonstrate that although radiography can determine the cause of delayed hatching, intervention may still occur too late, in Case 4 by only a few minutes. Case 8 also demonstrates that malpositioned embryos may be

successfully hatched after radiographic imaging, but the combination of exhaustion and an incompletely absorbed yolk sac makes them susceptible to post-hatching conditions. Despite intensive and early antibacterial therapy this chick succumbed to a yolk sac infection. We have also seen other malpositioned bustard chicks that appear to be 'physically exhausted' by the time intervention has provided a breathing hole or freed them. These chicks have a tendency to fade and die over the first 24-72 hours after hatching. Once a diagnosis of malposition is made in a chick that has failed to internally pip we would recommend immediate but careful ovotomy over the site of the bill to provide a breathing hole for the chick. Assessment of membrane vascularity should determine the speed of further assistance. The use of radiosurgery to cut the membrane in which blood vessels that had not regressed has been described (Olsen and Duvall, 1994) and may be applicable in some circumstances although we have not had any experience with bustard chicks. From our observations chicks that are assisted, but are still strong at the end of the process tend to be more viable compared with chicks that are 'tired' because of delayed intervention. The success of assisted hatching is mainly down to timing, but unfortunately this is easier to determine retrospectively, rather than early in the morning or late in the evening when many of these cases were played out. Case 8 also demonstrates the importance of providing antibacterial therapy to chicks from assisted hatches. It is well known that the survival rate of chicks that hatch with larger umbilical protuberances have a lower survival rate (Joyner, 1993).

Embryo malpositioning is not an uncommon condition, for example, it is estimated that 1%-4% of mature parrot embryos will be in an abnormal position at full development before hatching (Clipsham, 1996). Causes of malpositioning include incorrect turning, abnormal shaped eggs, poor temperature control, careless handling, physical deformities of the embryo, dietary deficiencies and genetic defects in inbred birds (Olsen and Duvall, 1994; Brown et al. 1996). The cause of malpositions described in these case reports was not determined for all but one chick, although temperature control, humidity, turning and weight loss were assessed and did not appear to be abnormal. In Case 3 a problem with the turning of the egg was suspected.

Unlike in parrots (Flammer, 1994), spraddle legs are relatively easy to correct in bustards with most chicks recovering after two to four days of taping. Flammer (1986) reported that this condition is sometimes responsive to injections with vitamin E and selenium in parrots, but in our experience taping the legs has proved successful. The treatment of curled toes has been more problematic because this condition was seen most frequently in Rufous-crested Bustards, which are the smallest bustard species maintained at the NARC. The main problems associated with taping of toes in this species are related to the small size of the chicks which weigh only 20g-25g at hatching.

Radiographic imaging to evaluate chick position in Californian Condor *Gymnogyps californianus* eggs has been shown to be a valid technique in determining whether eggs that are having problems hatching should be assisted (Ensley et al. 1994). Through these case reports we have been able to outline some of the procedures and treatments for some of the common hatching and post-hatching problems seen in bustard aviculture. From our experience with bustards we have found that it is possible to critically evaluate normal versus abnormal embryo position using radiography when there is doubt following conventional candling techniques. Post-mortem examination of a number of chicks provided further information to correlate with radiographic findings. The subjective nature of these case reports illustrates the need for more detailed information on the hatching process in normal and abnormal chicks. Incubation and hatch record and egg post-mortem examination forms are maintained at the NARC. Only with a larger database of information on the hatching sequence and time intervals for bustards can the aetiology of malpositions be determined and the timing for assistance optimised.

Table 1. Incubation parameters (mean, range) in bustard species maintained at NARC (source Anderson, 1998a; 1998b; Anderson and Simpson, 1998)

Bustard species	Start of incubation to internal pip (days)	Time to external pip (hrs)	Time to hatch from external pip (hrs)
Houbara	22 (21-22) n=8	9 (2-22) n=8	23 (12-31) n=13
Kori	21 (20-22) n=10	13 (3-24)	26 (6-39) n=20
Rufous-crested	19 (17-24) n=15	13 (4-24) n=14	18 (6-44) n=34
White-bellied	19 (19-19) n=3	19 (14-24) n=2	26 (8-38) n=5

Table 2. Average weight loss during artificial incubation of different bustard species (source Anderson, 1998a; 1998b; Anderson and Simpson 1998).

Bustard species	Weight loss %
Kori	14.9
Rufous-crested	12.3
White-bellied	16

Table 3. Radiographic exposure factors and average egg weights of the bustard species described in the case reports (source of egg weights Anderson, 1998a; 1998b; Anderson and Simpson, 1998).

Bustard species	Egg weight(g)	KV	MA	Time (seconds)
Houbara	52	60	20	0.12
Kori	146	60	20	0.2
Rufous-crested	37	60	20	0.12
White-bellied	50	60	20	0.12

Acknowledgments

The authors would like to thank the Crown Prince of Abu Dhabi, H. H. Sheikh Khalifa bin Zayed Al Nahyan, H. H. Sheikh Mohammed bin Zayed Al Nahyan and Mr M. Al Bowardi for their support of this work. We thank Dr J. Naldo, Miss J. Howlett, Mr A. Azur and the staff of the Aviculture Department for their technical assistance.

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* * *

A REQUEST FOR HELP FROM FLYCATCHER KEEPERS

Martin Vince is surveying flycatcher keepers on behalf of the Flycatcher Interest Group of the AZA (American Association of Zoological Parks and Aquariums) Passerine TAG. It wants to collect as much husbandry information as possible from public and private collections. The information will be used to compile a husbandry manual and establish a model population of the Verditer Flycatcher *Muscicapa thalassina*. It is hoped that the model population will help refine husbandry and breeding techniques for this species and, in turn, help establish guidelines for keeping and breeding similar species.

If you have experience of keeping flycatchers (including niltavas), you are asked to contact Martin Vince, Assistant Bird Curator, Riverbanks Zoo & Botanical Garden, PO. Box 1060, Columbia, South Carolina 29202-1060, USA. E-mail:martin@riverbanks.org.

ECUADORIAN BIRDS: SOME NESTING RECORDS AND EGG DESCRIPTIONS

by Harold F. Greeney

While visiting Ecuador, one cannot help but be amazed at the diversity and beauty of the avifauna. Of the over 1,600 species of birds recorded from Ecuador, many are among the most flashy and beautiful in the world. At a time when tropical forests are disappearing at an ever increasing rate, the need for detailed ecological and behavioural studies is urgent. Only with a good understanding of species' behaviour and ecological needs can we hope to develop effective methods of conservation. Simple observations of seemingly trivial details such as nest construction and breeding dates, provide enormously valuable data that can be used by conservationists and ornithologists alike. The following nest records represent fairly common species, that are nevertheless threatened by the destruction of their habitat. All observations were made during field work on the natural history of tropical butterflies and other insects, but the excitement of exploring the behaviour of these beautiful birds could not be ignored.

White-sided Flower Piercer *Diglossa albilatera*

San Isidro Ranch, Napo Providence, near Cosanga, elevation 1,700 m (approx. 5,600ft).

On December 18th 1996 a male and female were observed visiting a nest located approximately 10m (approx. 32ft) from the forest edge in a grassy field. The nest was an open grassy cup, about 50cm (almost 1ft 8in) above the ground, built in thick *Paspalum* sp. (Poaceae) grass shaded by ferns (Thelypteridaceae) and blackberries (Rosaceae: *Rubus* sp.). One nestling was found in the nest.

Rufous-collared Sparrow *Zonotrichia capensis*

San Isidro Ranch, Napo Providence, elevation 1,700m (approx. 5,600ft).

On December 10th 1996, a nest, similar to those described by Stiles and Skutch (1989), was discovered in low vegetation in the middle of a cattle pasture. Three eggs were in the nest. When the nest was visited on December 18th 1996, all of the eggs had hatched.

Lemon-rumped Tanager *Ramphocelus icteronotus*

Mindo, Pichincha Providence, elevation 1,400m (approx. 4,600ft).

On December 13th 1996 a lone female was observed building a nest about 4m (approx. 13ft) up in a citrus tree (Rutaceae) in an area of disturbed forest.

Long-billed Gnatwren *Ramphocaenus melanurus*

La Selva Lodge, Sucumbios Providence, 75km (approx. 46 miles) e.s.e. of Coca, elevation 250m (approx. 800ft).

On January 7th 1998 a nest was encountered beside a heavily travelled trail inside primary rainforest. The nest was similar to that described in Stiles and Skutch (1989) and was located approximately 30cm (1ft) above the ground, wedged in between the leaf axils of a small Cyclanthaceae palm. The small, cup-like nest was constructed of tightly woven palm fibres and small twigs. Two eggs were found. Both were white with a pale reddish tinge and red-brown speckling, heaviest at the broad end. When disturbed from the nest, the adult would fly only a short distance away and remain, just out of sight until I left at which time it would return immediately to the nest.

Ruddy Quail Dove *Geotrygon montana*

La Selva Lodge, Sucumbios Providence, 75 km (approx. 46 miles) e.s.e. of Coca, elevation 250m (approx. 800ft).

In early January 1998 two separate nests were located within primary forest habitat. While other authors have indicated that these birds likely nest on the ground (Howell and Webb, 1995), both of these were located approximately 1m (3ft 3in) above the ground and consisted of a loosely arranged platform of leaves and sticks. One was located in the crotch of a small tree, and the other was in on a tangle of branches and vines that formed at rough 'Y' shape. Each nest contained two buff-coloured eggs. The nest and eggs were similar to those described for this species from other areas (Stiles and Skutch, 1989). Adults would remain on the nest until the observer was closer than 2m (approx 6ft).

Wedge-billed Woodcreeper *Glyphorhynchus spirurus*

La Selva Lodge, Sucumbios Providence, 75km (approx. 46 miles) e.s.e. of Coca, elevation 250m (approx. 800ft).

On January 31st 1998 a single nest was located about 2m (approx. 6ft) up inside a small cavity in the side of a tree. This is similar to the nesting situations described from other locations (Stiles and Skutch, 1989; Wetmore, 1972). The tree was located inside primary forest habitat, but was immediately adjacent to the trail. It was difficult to see the nest itself, as the hole was only 8cm (approx. 3¼ in) diameter and the hole was 15cm (6in) deep. The hole was located on the side of the tree but the cavity was oriented vertically. Two pale coloured eggs were present but were not removed for fear of damaging them. The adult woodcreeper would remain quietly on the nest until the observer's face was only centimetres from the opening and then burst out, at which point it would fly out of sight.

The importance of observing and publishing all aspects of bird behaviour, biology, reproduction, and distribution has never been so crucial. The destruction of our world's forests and other habitats is increasing at an alarming rate. It is the hope of the author that more ornithologists and amateur birdwatchers alike will make known even the smallest observations of species in the field. One never knows when they may be adding a crucial link to the understanding of a species' biology, and aiding in its conservation.

Acknowledgments

As always, I am greatly indebted to Carmen Bustamante for allowing me to stay at the beautiful Hacienda San Isidro. Thank you to M. Lysinger for help in identifying birds and to the La Selva Lodge staff for their help and support. I would like to express special thanks to Bob and Katt Azar for their support and interest in my field studies of all kinds.

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IRON CONTENT OF RAMPHASTID DIETS

by Adrian Fowler, Liz Glen & Mike Kitcherside

One of the major causes of mortality in Ramphastids is haemochromatosis - iron storage disease. Currently, this condition is controlled by dietary management. Low-iron foods have become the focus of considerable attention, with several companies manufacturing diets to meet this specific requirement. The results of laboratory analysis of foods by Bristol Vet School are presented in the following table. It has been recommended that the diets of susceptible softbills should contain less than 40 ppm of iron.

Ramphastids are frugivores and, although we do not yet have the results for fruits, it is likely that most fruits are low in iron. The limited voluntary food intake precludes the exclusive use of fruits because the higher energy demands of outdoor housing cannot be met without the use of a nutrient-dense ration. Meat contains high levels of iron, in a form that is more readily absorbed than plant or mineral sources, and the common practice of feeding canine diets is to be discouraged. Vitamin and mineral premixes invariably contain high levels of iron and previous studies have shown even simple calcium supplements to contain as much as 11,000ppm.

Tannins chelate iron and thereby reduce its absorption. Water sources in the tropical rainforests of Central and South America are reportedly high in tannins and it may be that toucans in captivity are susceptible to iron overload because of a genetic adaptation to tannin-complexed iron. Captive birds rapidly become accustomed to the addition of dilute tea to the drinking water but this supplement is not without its problems. Tannins also reduce food intake and protein digestion, and caffeine is both a stimulant and diuretic.

One collection reported the use of clays as a potential means of controlling iron absorptions. We analysed two clay samples that were claimed to be similar in composition to deposits located in Ecuador. The iron content of these was exceptional. It is highly likely that more iron would be released into the intestine as a result of administering the clay than would be beneficially bound from the remainder of the diet.

All soils are likely to be high in iron and Ramphastids frequently swallow samples, either intentionally or inadvertently with food. In relation to the potential iron-intake by this route, low iron diets may be of little significance in controlling the problem.

Acknowledgements

We would like to thank John Ellis (Chessington World of Adventures), Laura Gardner (Leeds Castle), Ian Love (Rode Bird Gardens), Richard Harper (Desford Bird Gardens), Double Dutch Avian Products and Pets At Home for providing samples.

Diets & Supplements	% Dry Matter	Iron, ppm Dry Matter
Witte Molen Softfood & Fruit	88.02	60
Pretty Bird Softbill	85.60	115
Witte Molen Universal	86.38	131
Kaytee Exact Softbill	91.54	166
Avi-Plus Softbill	92.11	174
Sluis Mynah Food	90.73	246
Haith's Softbill Food	89.23	256
Witte Molen Mynah Pellets	91.26	259
Orlux Universal Granules	89.02	279
Orlux Universal Softbill	90.24	302
Other Commercial Avian Diets		
SDS Flamingo Maintenance	89.60	246
Wildlife Feeds Parrot Pellets	92.30	303
SDS Mazuri Zoo Diet A	85.38	336
Witte Molen Crane Maintenance	87.12	1145
Witte Molen Flamingo Maintenance	87.51	1062
Insectivore & Carnivore Diets		
Mealworms	39.27	191
Crickets	29.66	254
Hills Canine Maintenance (Dry)	91.24	256
Haith's Prosecto Insectivorous	89.70	262
Witte Molen Softfood & Insect	89.84	565
Orlux Insect Food	88.08	652
Pedigree Chun (Canned)	26.08	757
Supplements		
Eggfood (Orlux)	91.25	171
Rearing Food (Orlux)	89.78	186
Tea (Typhoo Decaffeinated)	87.75	245
Yellow Clay (Desford Bird Gardens)	98.97	15980
Red Clay (Desford Bird Gardens)	98.57	22750

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THE PRESIDENT'S GARDEN PARTY 1998 & 1999

by Stewart Pyper

The 1998 President's Garden Party was held on Sunday July 12th and that for 1999 on Sunday July 11th, by kind invitation of our President, Miss Ruth Ezra, and Vice President, Raymond Sawyer. There was an immense contrast in the weather for these two events - the 1998 garden party was held in overcast conditions, following a morning of incessant rain, while this year it was a hot day which made viewing the birds difficult, as they hid away until after tea, which was the best time to view them. In 1998 we were



Avicultural Society President, Miss Ruth Ezra, was present when Chairman, Ken Lawrence (left), made the presentation to Raymond of a painting of 15 species bred at Cobham

shown many interesting birds, including Blue-bellied Rollers which had bred and achieved what is probably the UK first breeding of this species. The pair bred again this year, and a second pair also bred. A detailed account of those breedings is being prepared for publication in the magazine. In 1997, I wrote about a pair of Red-billed Oxpeckers. In 1998, there were six at Cobham, which had hatched chicks but failed to rear them. This year there are two, four of them having gone to Birdworld, near Farnham. Waders, including Avocets, Black-necked Stilts and Masked Plovers, bred well in 1998 and again this year.

One of the highlights amongst the doves and pigeons in 1998 was that all three pairs of Bartlett's Bleeding Heart Pigeons bred successfully. This year we saw more young. In the waterfall aviary there is a group of Pink-

necked Fruit Doves, a species I cannot recall having seen before. Our member Derek Goodwin, in *Pigeons and Doves of the World* (Trustees of the British Museum (Natural History), 1970), was unable to provide much information about this species. This must have changed now though, because it is being bred in collections such as those at San Diego and Riverbanks Zoo & Botanical Gardens, South Carolina. It is a little larger than a Barbary Dove. The head, neck and upper breast are bright purplish pink, deepening to foxglove red on the middle of the breast, which is bordered by a white and then a greenish black band; the belly is grey. The back is green.

There appeared to be seven Carmine Bee-eaters which have been provided with new nest tunnels in an effort to encourage them to breed, but to date nothing has happened. The collection also includes Red-throated and White-throated Bee-eaters. I was really taken by a Garnet Pitta, which unfortunately was not easy to see. It is another species I cannot recall having seen before. There has been an increase recently in the variety of sunbirds being kept at Cobham, with the return of old favourites such as the Golden-winged, Bronze, Malachite, Scarlet-tufted Malachite (which Raymond calls *johnstoni*) and Tacazze, plus the Splendid, Beautiful, Scarlet-chested and a wonderful Mrs Gould's. The latter looked magnificent, displaying its full range of colours as it came forward to show itself off. Other nectar-feeders on view included a Ruby-Topaz Hummingbird and a Giant Hummingbird. The latter lives in the waterfall aviary, which is the aviary in which the second pair of Blue-bellied Rollers bred. The Blue-faced Honeyeaters are not breeding at present but the small colony was lovely to watch.

Red-billed Choughs had bred for the second year, after earlier disappointments, which included one surgically sexed pair later proving to be two females! Several collections have this species but breeding results are not very encouraging, while at Cobham they appear to be reproducing well. The Island Thrushes continue to breed, as do the Green Wood Hoopoes and Black-cheeked Woodpeckers. The Keel-billed Toucans have been moved to an aviary at the back in an effort to give them more privacy. As on previous visits, we saw a good selection of starlings, though only the Superb Sparrows are breeding at present and appear to be prolific.

These are just a few notes on my personal observations made during the short time I had to look at the birds. There were undoubtedly birds which I missed that were seen by others and deserve a mention.

During tea Raymond was presented with a marvellous painting showing 15 species bred at Cobham, which were UK first breedings. The Chairman, Ken Lawrence, also presented a watercolour painting of Frinton-on-Sea to our much loved President, who kindly donated all the monies from the ticket sales, amounting to approximately £1,200 (about US\$2,000), to the Society's funds and for this we are all most grateful.

LETTERS

Saving the Endangered Orange-bellied Parrakeet (*Avicultural Magazine* 104, 2: 49-52) by J.R. Hodges

We wish to respond to this article on behalf of the Orange-bellied Parrot Recovery Team and all who have supported our endeavours over the last 15 years. The article contained some surprising inaccuracies and gives a false impression of the work we have done and the difficulties we still face. The team co-operated with Hodges (providing light plane transport for one of his visits to Melaleuca) and we are disappointed that he did not check his facts more carefully. The team strongly values input from aviculturists.

In his article, J.R. Hodges raised a number of his personal concerns with the recovery programme, and suggested that some could be solved by fostering more active involvement by aviculturists, and attracting revenue through the sale of captive-bred birds. Such matters have been considered by the team over the years and some of them have been actively implemented. For example, we have two experienced aviculturists on our team (Peter Brown and Len Robinson) as well as zoo staff. We welcome expert advice from aviculturists in relation to husbandry of the captive population. We recognise the obvious value of establishing more than one captive breeding colony and now have three captive colonies (not one or two as claimed), one in Tasmania and two in Victoria, including one with a private aviculturist. Last season a record 54 young birds were reared from a captive population of 83 adults in these three colonies. It is doubtful that such success would have been achieved if the birds had been more dispersed.

The captive breeding programme was instigated mainly as an insurance policy, to keep a healthy stock of captive birds in case the species did not survive in the wild. The programme has been far more integral and useful than that, allowing us to supplement wild stocks in new habitats and to learn much about the potentials and pitfalls of reintroduction by liberating banded birds as acknowledged by Hodges. We believe it has been a success, and although we will always strive for improvement and look at new ideas we do not accept that a radically different approach is needed.

Management of the wild population is the area where improvements really are needed. Here we share Hodges' concern that the species remains critically endangered, and numbers have only increased marginally in the wild since our work began. Nevertheless, some achievements have been made. The previous decline has been arrested, and much remaining habitat has been reserved. Valuable management initiatives have been implemented in much of the birds' summer and winter range, but clearly they have not worked as well as expected and new initiatives need to be tried.

Currently we are helping develop better fire regimes in the breeding habitats of south-west Tasmania, and attempting to restore some previously used winter habitats in Victoria and South Australia. Our philosophy is to make new habitats close to others in current use, rather than risk unwittingly damaging existing habitats by misguided attempts to improve them. Habitat restoration or creation is a delicate and expensive task, that needs to proceed in a spirit of adaptive management. We are proceeding as fast as resources permit, and need to accelerate our efforts. The programme has been well supported by industry and government over the years but now we see an urgent need for more resources, just when some fund donors were expecting demands to decrease.

Here, Hodges may well point to sales of captive-bred birds as a revenue raiser. Tempting as this is, the team has serious reservations on two main grounds. Firstly, there is a widely held view that legal trade in rare birds can place new pressures on wild populations through legitimate demands for wild stock to diversify gene pools, and by acting as a cloak for illegal trade involving a careless or unscrupulous minority of aviculturists. This view can be debated at length, and is not held by all members of the OBP Recovery Team. However, it is the dominant view among wildlife policy makers in Australia, and hence has influenced the thinking of the Recovery Team and its scope for actions of this sort. Secondly, the current government philosophy (across most political parties) is that commercial trade is a matter for the private sector, and government involvement should be reduced to a minimum. Yet species recovery programmes need government involvement because they are done for public good not private gain. Hence a practical issue arises about how some of the benefits of private trade in birds could be diverted to the common good of conserving the species in the wild. This may not be an insurmountable problem, but it is not as simple as suggested by Hodges. Hodges' example of the Naretha Blue-bonnets may provide a model, but we know this situation differs in a number of important respects. One of the simplest ways of attracting more funds to the programme is to ask people to support it, and we have raised some funds from birdwatchers, conservationists and aviculturists in Australia (and overseas, to a much lesser extent) by seeking donations. Aviculturists as a group can be highly supportive of conservation efforts, both through their own captive breeding efforts and through financial support of programmes to conserve species in the wild.

Because the greatest need for Orange-bellied Parrots is to conserve the wild population and its habitat, the best way in which aviculturists can help the species is to support our efforts to conserve habitat and increase the wild population. Any donations or offers of advice would be very welcome and should be addressed to Jon Starks at Birds Australia (a non-government

organisation) 415 Riversdale Road, East Hawthorn, Victoria 3123, Australia. Tel: 61-3-98822622/Fax: 98822677/E-mail: research.projects@raou.com.au

We share Hodges' enthusiasm for this beautiful bird and the remarkable country it inhabits, and will not rest until we have done what we can to conserve it in captivity and the wild.

Richard H. Loyn on behalf of the Orange-bellied Parrot Recovery Team (Chair, Mark Holdsworth, Tasmanian Parks & Wildlife, GPO Box 44A, Hobart, Tasmania 7001, Australia (E-mail: markh@dpiwe.tas.gov.au)).

Prof. Hodges was asked if he wished to respond and this is what he wrote:-

I was pleased to read the above letter. At least somebody had read my article. However, I was surprised by the writer's aggressive attitude in his first paragraph where he refers to my 'surprising inaccuracies' and to the 'false impression' which I gave. He does not specify what the inaccuracies were or how the false impression could be derived. He goes on to state that the recovery team co-operated with me and even 'provided light plane transport for one of my visits to Melaleuca.' The only member of the team I have ever been able to contact, despite making several efforts, is Peter Brown whom I first met about 40 years ago when he worked for Reg Partridge. The one occasion on which I visited Melaleuca was with my wife and two friends from the University of Hobart. We flew with 'Par Avion', a small commercial airline, at our own expense!

Mr Loyn obviously shares my enthusiasm for and interest in this lovely member of the exquisite genus *Neophema*. I do not agree that the Orange-bellied species will be saved from extinction by work on its habitat and the liberation into it of captive-bred specimens and I deplore the fact that vast sums of money have been wasted in this way. The migratory behaviour of the species exacerbates the problems associated with preventing its extinction. However, I think that it can be saved by captive breeding. I believe that it would already have been safe (like Splendid, Turquoise and Princess of Wales Parrakeets, for example) if most of the captive-bred specimens had been distributed to responsible aviculturists. Surely having perfect specimens of such an attractive species in appropriate aviaries is infinitely more desirable than stuffed, decaying, dusty specimens in museums.

BOOK REVIEWS

STARLINGS AND MYNAS

Starlings and Mynas by Chris Feare and Adrian Craig is a welcome recent addition to the Helm Identification Guides. Many of the species are familiar avicultural subjects, but a surprising number of the others are unfamiliar and are probably unknown in aviculture.

The first thing I did was to flick through the 32 colour plates grouped together towards the front of this attractively presented 285 page guide. Painted by Barry Croucher, Chris Shields and Kamol Komolphalin, they show all 114 species (which includes the two oxpeckers), sex differences when they occur and distinctive juvenile plumages, as well as various well differentiated races. I immediately spotted several species I cannot recall having seen portrayed before, among them the African White-collared Starling, Madagascar Starling, some of the Sulawesi endemic starlings/mynas, the Polynesian, Micronesian and Melanesian *Aplonis* glossy starlings, and the White-eyed Starling which possesses two long tail streamers, up to three times the length of the other tail feathers.

I next checked the species accounts, choosing three species I know well - the Emerald, Violet-backed (though here the authors revert to the name Amethyst Starling; the names Plum-coloured and Violet-backed Starling are given secondary or alternative names status) and Splendid Starlings. I quickly spotted the names Pyper, Wilkinson, Ellis and Sawyer and, on checking, found that the authors cite several references from the *Avicultural Magazine*. Considering the number of Emerald Starlings that seem to continue to be exported from West Africa, it comes as a surprise to learn that in the wild the nesting habits of this species remain undescribed, and that the authors have had to rely largely on what information has been published in this magazine.

The fact that each species is illustrated in colour, there is a detailed description and measurements for both sexes (females are usually smaller), along with the quality of the information to be found under the headings, Food and Feeding, Breeding, and Behaviour, mean this guide will prove invaluable to aviculturists interested in these species.

I was surprised to see that the Superb, Hildebrandt's, Shelley's and the Chestnut-bellied Starling are placed not in the genus *Spreo* but in the genus *Lamprotornis*, along with the Golden-breasted Starling. The other member of the genus *Cosmopsarus* (which ceases to exist), the Ashy Starling, is placed in the genus *Spreo* along with the African Pied, Fischer's and the White-crowned Starling. What, I wonder, will aviculturists who are familiar with these species think of these changes? The reasons for them, which

mostly seem to be to do with the structure of their feathers are explained by the authors, who at one point say: 'such a radical rearrangement is bound to stimulate debate and further study.' Perhaps some members will have views on these changes and be able to add to what is known about some of the species involved.

It is also a fascinating book to dip into. Included are sections on Starlings in Captivity, Conservation and - Starlings as Food! Touched upon briefly is the release into the wild of captive bred Bali Mynas (the name used in this guide), some of which have apparently turned-up later in bird shops. I was also interested to read what little is known about the Nias Hill Myna, which is probably threatened both by the destruction of the indigenous forest on Nias and other islands off the south-west coast of Sumatra, and pressure from trappers, as it is said to be famous for its quality as a talking bird. In the late 1950s I looked after one in the Bird House at London Zoo, but have not seen another since then. I remember it being considerably larger than the other hill mynas, which is not quite the impression one gets from the plate showing these birds. It did not talk but made various sounds (some possibly in an attempt to talk) in a deep voice and screamed and whistling extremely loudly. When it opened its bill to its fullest extent it had an enormous gape and looked as so it could almost swallow you!

This guide is then, even at £32, a 'must' for aviculturists, for identifying the many species and learning more about them. The Helm Identification Guides are published by Christopher Helm (Publishers) Ltd, a subsidiary of A. & C. Black (Publishers) Ltd, 35 Bedford Row, London WC1R 4JH.

Malcolm Ellis

TANAGERS

My only (minor) criticism of *Tanagers*, a recent addition to the range of Helm Identification Guides, published by Christopher Helm Ltd is reflected in Theodore A. Parker's Foreword in which he refers to the subjects as being '...among the most colorful and vibrant of New World birds'. Perhaps I am being a little unkind but, like most aviculturists who have first-hand experience of this most colourful of families, my first reaction to the otherwise excellent plates is a lack of 'vibrant' colour; even that most dazzlingly iridescent species, the Paradise Tanager *Tangara chilensis* fails to capitalise on the sheer brilliance of its plumage by metaphorically leaping out of the plate it shares with nine other members of the genus - including other 'luminaries' such as the Seven-coloured *T. fastuosa* and Red-necked Tanagers *T. cyanocephala*.

More than 240 species of tanagers are dealt with in this excellent, updated and invaluable monograph by Phyllis and Morton Islers. The latest edition includes new information (including new species) since its first publication in 1987. Although essentially an identification guide and therefore mainly of interest to ornithologists and others of like interests, so little in the way of comprehensive literature on this large and diverse family exists that the Islers' work will be welcomed by a wider audience, including aviculturists. The authors comment that they have seen the majority of tanagers in the field and have thus had the opportunity to study the behaviours of some species in detail.

The colour plates, by Morton Isler, seem to owe much to museum skin collections but are little the worse for that (except for their lack of vivid colour!) and are meticulously accurate. Sexual differences are shown for almost 50% of species, while more than one race is illustrated for 74 tanagers (as many as six for some of the others). More to the point, the arrangement and scale of species on plates makes identification particularly straightforward.

Information is concise but very informative and is contained under such headings as Geographic Range, Elevational Range, Habitat and Behaviour, Vocalisations, and Breeding. Sources of information are provided for each species. Considerable detail is contained under Habitat and Behaviour, much of it, ranging from food and environment to stomach contents, will be of value to aviculturists.

The book consists of 406 pages including 32 full-page colour plates. Three pages of literature are cited in the 1999 updated edition, together with a very useful 18 pages of references. Prospective avicultural purchasers may be encouraged by the fact that names familiar to them, including Delacour, Scamell, Ruschi, Murray and others are included among these sources of information.

Definitely a worthwhile acquisition for any ornithological or avicultural library whose owner has an interest in New World species.

Tanagers is published in the UK in paperback price £29.99, by Christopher Helm (Publishers) Ltd., a subsidiary of A. & C. Black (Publishers) Ltd., 35 Bedford Row, London WC1R 4JH. In the USA it is published by Smithsonian Institution Press.

Frank Woolham

BIRD OF PARADOX

The mischievous and destructive nature of the Kea *Nestor notabilis* is legendary. It is, I believe, the most intelligent (and among the most endearing) of the parrots which I have had in my care. New Zealand's mountain parrot evolved in harsh conditions; it needed to be very resourceful to survive. Unfortunately, only an estimated 3,000 survive today. Yet it is an enormous tourist attraction in some localities - and has also attracted much unfavourable publicity due to its playful habits.

In *Kea, Bird of Paradox*, Judy Diamond and Alan Bond from the University of Nebraska, explore certain aspects of the Kea's history and natural history. They start by reconstructing the environment in which the Kea evolved, an environment it shared with moas and other long extinct species. They continue by describing how an expansion in Kea numbers appears to have coincided with settlement of the high country. But soon Keas had earned a reputation as sheep killers. Thousands were killed.

In Chapter 3 they describe the social behaviours of birds which they studied. These are illustrated with delightful line drawings (this description does not do them justice) of different aspects, such as play behaviour, and a male feeding a fledgling. (There is no colour in this book - only black and white photographs and drawings.) Mark Marcuson's drawings are simply outstanding. They include some which show bill shapes of male and female, and 'facial expressions' (in fact, the way the head feathers are erected) to demonstrate aggression, defensiveness, submissiveness, etc.

The chapter on growing and learning describes the role of young birds in Kea society. In another chapter, aspects of behaviour and ecology are compared with those of the other member of the genus, the Kaka. In the sixth and final chapter the authors describe contacts between Keas and people. These are not just damaging to human property but often result in Keas risking or losing their lives.

The book seems to end abruptly at page 150 (pages 151-230 consist of appendices, notes and the index). As far as it goes it is excellent - but there are so many other aspects which could have been explored. The species' breeding biology is hardly mentioned. Here avicultural experience could have been drawn upon. For example, those who have worked with Keas for so many years at Paradise Park would have been an invaluable source of information.

Kea, Bird of Paradox is published by University of California Press (ISBN 0-520-21339-4, California and London). In the UK it costs £18.95 plus postage from for example, Natural History Book Services, 2-3 Wills Road, Totnes, Devon TQ9 5XN. Tel: +44 (0) 1803 865913/Fax: +44 (0)1803 865280/ E-mail: nhbs@nhbs.co.uk.

Rosemary Low

WILDLIFE GUIDE TO TROPICAL MEXICO

The Ecotravellers' Wildlife Guide to Tropical Mexico by Les Beletsky, is similar in format to the same author's wildlife guide to Costa Rica, reviewed recently by Dave Coles (*Avicultural Magazine* 104, 4: 182-183).

Endorsed by the Wildlife Conservation Society (founded in 1895 as the New York Zoological Society), *The Ecotravellers' Wildlife Guide to Tropical Mexico* (the Cancún region, Yucatán Peninsula, Oaxaca, Chiapas and Tabasco) is, like the previous title, much more than just a simple wildlife guide. The opening chapter is titled Ecotourism: Travel for the Environmentally Concerned. Other chapters cover a range of topics including Habitats (there is also a separate section with 21 colour photos illustrating various habitats, etc.), Parks, Reserves, Getting Around, Environmental Threats and Conservation.

Chapters 6-10, the bulk of this 498 page paperback guide, cover Amphibians, Reptiles, Birds, Mammals and Coral Reef Wildlife, in the latter instance, written by Richard Francis. There are 104 colour plates, of which plates 20-69, by David Beadle, illustrate a wide cross section of bird species, a number of which are known in aviculture.

The guide ends with an account of WCS Conservation Work in Latin America and a form with which to make a membership contribution to the WCS.

The Ecotravellers' Wildlife Guide to Tropical Mexico (ISSN: 0-12-084812-0) is published by Academic Press, 525 B Street, Suite 1900, San Diego, California 92101-4495, USA. It is priced £19.95 in the UK, \$27.95 in the USA and \$38.95 in Canada.

Malcolm Ellis

NEW & VIEWS

CONTROVERSIAL ISSUE

Birds Australia is developing a policy on the trade and harvesting of wild birds and welcomes ideas on this controversial issue. These should be sent to the In Tray column of *Wingspan*, the quarterly journal of Birds Australia, formerly the Royal Australasian Ornithologists Union, 415 Riversdale Road, Hawthorn East, Victoria 3123, Australia (E-mail: wingspan@raou.com.au).

Writing about the international bird trade in the latest issue (Vol.9, No.3), Stephen Garnett concluded that, to his surprise, there seems to be a reasonable case for a regulated trade in uncommon species. Adding, any such trade would, of course, have to be part of a broader programme that includes adequate understanding of the species in the wild, monitoring, genetic fingerprinting and enforcement. Stephen believes: 'trade integrated with conservation, that harnesses the enthusiasm, energy and considerable finances of aviculture, and managed in a manner that puts resources back into conservation particularly for countries with no other source of conservation income, could provide more benefits than an ineffective blanket ban that promotes cruelty, environmental vandalism and an unnecessary division between responsible aviculture and those that strive to save wild populations.'

* * *

LADY AMHERST'S PHEASANT

Jane Camp, who wrote the obituary to Ed FitzSimmons in the previous issue (p.48) is better known in avicultural and zoo circles as Jane Cooper, who used to work for the late John Yealland when he was Curator of Birds at London Zoo. Dealing with an enquiry from a police officer about a pheasant that had been handed in, she asked him to describe the bird. 'It sounds like Lady Amherst's Pheasant', Jane told him. 'Good', said the police officer 'Do you have her phone number, I'll ask her to send someone to collect it?'

* * *

SPATE OF DEATHS

The entire collection of 26 penguins at Marwell Zoo, near Winchester, Hampshire, eight penguins at Bristol Zoo and three at Edinburgh Zoo have died. It remains unclear whether all or only some of these deaths were due to avian malaria.

TWIN PEAKS

Non-native birds which bred in the wild in the UK in 1997, listed in the latest *British Birds* 92,9:412-416, include the Ring-necked Parrakeet *Psittacula krameri*, Alexandrine *P. eupatria*, Eagle Owl *Bubo bubo* and Lady Amherst's Pheasant *Chrysolophus amherstiae*. There were several reports of Golden Pheasants *C. pictus* and Carolina Wood Ducks *Aix sponsa*, but no proof of breeding. The highest number of Ringnecks was 3,000 in Surrey, with a new record of 1,507 birds roosting in August of that year at Esher Rugby Club. The escaped pair of Alexandrine Parrakeets bred successfully in north Liverpool.

* * *

RARE TOURACOS

The latest *Bulletin* of the African Bird Club, Vol. 6, No. 2, has on page 113, two colour photos of a Bannerman's Touraco *Tauraco bannermani* on its nest on Mt. Oku, Cameroon. Prince Ruspoli's *T. ruspolii* was the subject of a full-page colour photo on the back cover of Vol.4, No.1, March 1997, and there are notes about this species (pp. 29-30) and what is probably the first ever photo of its egg.

* * *

RECENT APPOINTMENTS

Steve Bromfield is the new Curator of Birdworld, near Farnham, Surrey. He was previously stock manager. Dr David Waugh, formerly Scientific Director of the Loro Parque Fundación, is now Director of Edinburgh Zoo.

* * *

BACK TO NATURE

Up to 100 Red-billed Oxpeckers *Buphagus erythrorhynchus* are to be caught in the Kruger National Park and released in the Queenstown area of Eastern Cape Province, in the hope that their liking for eating ticks will help local farmers cut the costs of dipping and other pest control measures. Others have been introduced recently into some Eastern Cape game reserves. The Red-billed Oxpecker became extinct in the province in the 1980s due, according to a report quoted in the latest *Newsletter* of BirdLife South Africa, Vol.2, No.3, to the misuse of poisons and pest control substances. The return of the oxpeckers to Queenstown is said to be especially significant in that it will be the first time these birds have been returned to a farming area in the province.



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JOHN STOODLEY

John Stoodley, who with his wife is credited with the first UK breeding of several Amazons *Amazona* spp., Pionus parrots *Pionus* spp. and Jardine's Parrot *Poicephalus guilielmi*, has died following a long illness. Accounts of three of these breedings were published in the *Avicultural Magazine* (83,2:61-64 & 83,4:199-200).

* * *

BOOKS by Rosemary Low

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ADDRESS OF THE EDITOR

Malcolm Ellis, Hon. Editor, The Avicultural Magazine, The Chalet, Hay Farm, St. Breock, Wadebridge, Cornwall PL27 7LH, England.

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1999

AN HISTORICAL REVIEW OF PARROTS BRED IN ZOOS IN THE USA

by Josef H. Lindholm III

Compiling records of *Wild Birds Bred in Captivity in the Eastern United States*, Beebe and Crandall (1909) were aware of only four taxa of parrots reproduced at that time. The first breedings of the Cockatiel *Nymphicus hollandicus* and Black-cheeked Lovebird *Agapornis nigrigenis* (misattributed as the Masked Lovebird *A. personata*) were achieved by private aviculturists. The Budgerigar *Melopsittacus undulatus* is credited to the New York Zoological Park. The final species was the Carolina Parakeet *Conuropsis carolinensis*, for which Beebe and Crandall (1909) provide the record of 'one bird... hatched from an egg which had been placed under a Turtle Dove' on September 9th, 1885 at the Philadelphia Zoological Garden.

While the Carolina Parakeet was bred repeatedly in Germany as early as 1881 (Hopkinson, 1926; Kolar, 1972), I am aware of only two other North American facilities breeding this species. The Smithsonian ornithologist, Robert Ridgeway maintained a pair, collected in Florida in 1896, in his house. Several young were hatched of which one, produced in 1902, and partly hand-raised due to parental neglect, died in the possession of the malacologist, Paul Bartsch in 1914 (Bartsch, 1957; Peterson, 1957).

The Cincinnati Zoo purchased 16, collected in Florida in 1886 (Fuller, 1987; Ehrlinger, 1993). Ehrlinger (1993) records that 'a number... were hatched and raised... Generally, however, the birds were inattentive parents and often tossed their eggs out of their nests'. By 1917 only a single pair of Cincinnati's birds (both from the original shipment) was still alive. The female died late that year. The male, the last in captivity, died on February 21st, 1918. A pair from the 1886 group was given to the New York Zoological Park in 1911, but both were dead in less than two years (Bridges, 1974).

When Crandall (1927) produced a second revision of the 1909 list, there was only a single parrot species to add to the original four: the Peach-faced Lovebird *A. roseicollis*, credited to the New York Zoological Park. By that time there were a number of comprehensive parrot collections in zoos in the USA, but reproduction was almost non-existent. In its first 40 years, from

1888 through 1928, the National Zoological Park obtained 104 taxa of parrots (Mann, 1930a), yet total parrot breeding results for this period amounted to only five Budgerigars (Mann, 1930b).

San Diego Zoological Garden

Crandall (1930) was able to add a further 11 species of parrots in his final revision of *Records of Birds Bred in Captivity in the United States*. All had been hatched from 1926 through 1929. Ten of these first breedings in the USA were the achievements of private aviculturists. The record for Swainson's Lorikeet *Trichoglossus haematodus moluccanus* was credited to the San Diego Zoo.

Founded with exhibits remaining from the 1916 Panama Pacific Exposition, and relocated to its present site in 1922, the San Diego Zoological Garden had, by the late 1920s, attained the status it has held ever since as having one of the world's leading parrot collections. Through 1929, 60 taxa were obtained (Dolan and Moran, 1970). In 1925 and 1927, exchange shipments arrived from Australian zoos. A collection of lories and lorikeets was received from the Surabaya Zoo in 1929. Various species were presented by military personnel in Central America. Belle Benchley (1930a), Executive Secretary of the Zoological Society of San Diego, wrote: 'The bird collection at the zoological garden, more particularly the parrot group, is now so large that it has been decided to center our efforts upon adding only the very rare, or the especially beautiful or spectacular, to this group'.

Through 1930, 14 species were hatched at the San Diego Zoo (Dolan and Moran, 1970). While many of the records for this period and the early 1930s appear to have been lost, there exists very interesting documentation. Belle Benchley, Director of the San Diego Zoo from 1941 through 1953, is best remembered for her work with primates. However, I was informed by K.C. Lint (Curator of Birds from 1946 through 1976) that she was a highly competent aviculturist, personally caring for many of the birds during the Second World War.

From 1929 through 1932 she contributed a number of notes and articles to *Aviculture*, the journal of the Avicultural Society of America. These included detailed discussions of the breeding of Edward's Lorikeet *T.h. capistratus* in 1931 (Benchley 1932c), Red-sided Eclectus *Eclectus roratus polychloros* in 1929 (Benchley 1929a&b, 1930a) and Blue-winged Grass Parrakeet *Neophema chrysostoma* in 1930 (Benchley, 1930b), as well as, in 1931 hybrids between the now severely endangered Red and Blue Lory *Eos h. histrio* and Eastern Violet-necked Lory *E.s. squamata* (Benchley 1932a&b). Accounts of two unsuccessful nestings of the Purple-crowned Lorikeet *Glossopsitta porphyrocephala* in 1930 and 1931 (Benchley 1930b, 1932a), where in both cases eggs were eaten near hatching, are most

interesting. These are apparently the only Western Hemisphere breeding attempts for this species on record; they were alluded to by Rosemary Low (1977) who was aware of no details.

Of particular interest in these *Aviculture* articles are statements of collection policy at that time. Regarding the *Eos* hybrid, Mrs Benchley (1932a) wrote: 'The San Diego Zoo does not exhibit hybrid species nor freaks of any kind. We will probably send it, therefore, to some one of the aviculturists who is interested in carrying out such experiments'. (The only parrot specifically noted by Delacour (1937) in his discussion of a 1936 visit to San Diego was 'a hybrid *E. histrio* x *E. bornea*').

Prior to eventual success with this species, Benchley (1929b) noted '...the failure of our Blue-wing Grass Parrots to make any serious attempt to breed. These latter have been in the garden now for two years and they will be sent to Dr Patrick, who has been doing such interesting things with some of the rare parrots in the breeding way. In a large public collection the chances for breeding are less and the time of the bird man has to be devoted to a large extent to the routine cleaning and caring for the collection. Primarily, the object of a zoological garden is to maintain a comprehensive and interesting exhibit from the standpoint of public interest. Few visitors truly appreciate the rarity of a Blue-wing Grass Parrot and find the Red-rump or Chattering Lory in the adjoining cages much handsomer and more fascinating. On the other hand, those directly responsible for the development and maintenance of the zoo could not keep their interest at the necessary standard nor their zeal sufficiently intense to offset the drudgery of the hard work if it were not for the opportunity offered in such a sphere to contribute towards the scientific knowledge of the world and to do their share towards the preservation of the disappearing species'.

As it happened, only one of the two pairs of Blue-winged Grass Parrakeets imported in 1927 was sent to Dr Leon Patrick in 1929 (Benchley, 1930b). Dr Patrick, of Orange, California, was one of the pioneers in what was to become the widespread propagation of Australian parrots in southern California. Prestwich (1930) cited Dr Patrick as '... the first American to make a serious attempt to save some of the fast disappearing species of Australian parrakeets (sic), and it is mainly through his untiring efforts that others have become interested; and what was considered a doubtful experiment three years ago now gives promise of success. In 1928 he successfully bred and brought to maturity one of the most difficult species - the Pileated Parrakeet *Purpureicephalus spurius* - as well as some Blue-winged Grass Parrakeets'. Throughout its history the San Diego Zoo has continued to maintain a close relationship with private aviculturists.

Belle Benchley (1932a) observed: 'We have been unusually busy this year due to doubling up on work and sometimes I wonder that we have done

as well as we have. We have about 68 species of the parrot family in almost as many cages. As our cages are large, it means a lot of work just taking care of that part mechanically without the fussing necessary for little birds'. The year 1932 nearly proved disastrous. In August, the San Diego County Tax Assessor attempted to auction off the holdings of the Zoological Society, including all animals, to collect \$6,358 in back taxes. The auction was thwarted by local police officers who announced that the 200 potential bidders would be prohibited from removing animals from the premises (Morgan, 1990). Despite general depression conditions, the resulting public outcry led to an unambiguous tax-exempt status for the society and in 1934 a property tax levy of two cents per every hundred dollars. That year the zoo's holdings included 11 taxa of lories and lorikeets, 10 of cockatoos and eight of conures among the extensive parrot collection (Benchley, 1934).

By March 1st, 1951, 140 parrot taxa had been maintained at one time or another at San Diego and 69 were present at that date (Stott, 1951). Ken Stott Jr. (1951) then General Curator, listed 35 taxa of parrots hatched to that point, as well as five hybrids. Two species stand out in this list for sustained propagation. Leadbeater's Cockatoo *Cacatua l. leadbeateri* commenced breeding in 1935, and roughly 30 were reared to maturity by 1951 when three generations were represented in the collection. A single pair of Southern Bare-eyed Cockatoo *C.s. sanguinea*, which produced its first chick in 1929, had hatched 'approximately 50' by 1951. Dolan and Moran (1970) document hatchings every year from 1933 through 1953, which produced at least 44, as well as 12 hatched from 1955 through 1960, again without missing a year, and single specimens hatched in 1964 and 1966.

By the end of 1968 the historical total of parrot taxa hatched at San Diego Zoo had grown to 69. As of December 31st, 1968 176 taxa of parrots were present (Dolan and Moran, 1970), while the total number of bird taxa at the zoo was 1,076. The year-end total for bird taxa peaked on December 31st, 1969 with 1,126 (represented by 3,465 specimens). The total number of birds raised to maturity in 1970 (as reported to the *International Zoo Yearbook*) was 101 of 34 taxa (Lindholm, 1993). Eighty-three of these birds were parrots, representing 25 taxa, all Old World. Of these, 29 were lories or lorikeets, representing 10 taxa.

For several years in the early 1970s, roughly 200 taxa of parrots were held at the San Diego Zoo and parrots - especially lories and lorikeets, Australian endemics, and *Psittacula* species - continued to predominate in the annual tallies of birds bred. As will be discussed later, this situation would be altered by the mid-1980s.

Chicago Zoological Park

Prior to the 1960s, only one other 'mainstream' zoo in the USA accomplished a significant record of parrot breeding. Opened to the public in 1934, the Chicago Zoological Park (always known more popularly as the Brookfield Zoo) acquired that year 'the greater part of the collection of the Taronga Zoological Park in Sydney... shipped in one huge boat-load' (Plath, 1935). Purchased for \$11,000, the shipment consisted of 98 mammals, 746 birds and 32 reptiles (Ross, 1997). The Australian specimens made up the greater part of Brookfield's bird collection for some years.

The psittacosis scare then being widespread, special arrangements were made to quarantine the Australian parrots at Brookfield with the result that the Perching Bird House and the Parrot House were not opened to the public until early 1935. The latter structure was unique in American zoos. While San Diego maintained extensive series of outdoor parrot exhibits, and a number of other zoos' bird houses (most notably Seattle's built in the post-war 1940s) (Hill, 1953) included separate parrot halls, only the Chicago Zoological Park constructed a building with indoor exhibits devoted entirely to parrots.

At its opening the Parrot House held 41 taxa of parrots distributed among 35 aviaries. All but 12 were Australian (Plath, 1935). With individuals scattered among other locations in the zoo, the total number of parrot specimens was 259. By 1937 the total number of aviaries in the Parrot House had been reduced, by amalgamation, to 23. The number of taxa had grown to 52 (Plath, 1937). Up to this time no successful reproductions had occurred, although eggs had been laid by Swainson's Lorikeets, Black Lories *Chalcopsitta a. atra* and Bourke's Parrakeets *N. bourkii*.

Karl Plath, Brookfield Zoo's Curator of Birds from 1935 through 1961, had long before his appointment been one of America's leading private aviculturists (Prestwich, 1930). A Chicago draper, he had by 1929 achieved the first breedings in the USA of Nyasa Lovebird *A. lilianae* and Green-rumped Parrotlet *Forpus passerinus* (Crandall, 1930).

In 1938, a long-planned series of off-exhibit outdoor breeding runs was constructed and stocked on June 5th of that year. Plath (1939) provides a summary of that first breeding season: seven species, all Australian, were hatched. The highlight was the first breeding in the USA of the Princess Parrot *Polytelis alexandrae* (from a pair which arrived in Chicago on July 14th, 1938 - one of three pairs which marked the species' first importation into North America). By 1950 the original 12 runs had been increased to 23 and an additional large Australian shipment had arrived in 1949. Plath (1950) listed 29 pairs representing 20 species, as well as two hybrid pairs, which he set up for that season. At this time Brookfield maintained 53 taxa of parrots. Plath (1951) enumerated all parrots fully reared there from 1938 through mid-1951.

Aside from 109 Budgerigars, there were 175 specimens representing 13 taxa. Outstanding among these records were 36 Australian King Parrots *Alisterus scapularis*, 35 Swainson's Lorikeets, 27 Princess Parrots, 21 Bourke's Parrakeets and 18 Crimson-winged Parrots *Aprosmictus erythropterus*. In addition, an indoor exhibit aviary in the Parrot House was the site of the first captive breeding of Goldie's Lorikeet *T. goldiei* in 1951.

In 1959, Brookfield's off-exhibit parrot breeding facility was demolished to make way for the Seven Seas Dolphinarium. Small (1970) lists all parrot breeding at the zoo up to that point. By 1959 49 Swainson's Lorikeets had been raised, together with 28 Princess Parrots and 26 Crimson-winged Parrots. In the Parrot House the number of Goldie's Lorikeets raised had risen to 11. The total number of parrot taxa raised from 1938 through 1959 totalled 19 (Small, 1970).

Small (1970) gives a detailed account of the breeding programme which commenced on public display in the Parrot House following the loss of the off-exhibit runs. From 1962 through 1969, 135 parrots of 10 taxa (plus two hybrids) were raised. Chief among these were 65 Nyasa Lovebirds (48 had been raised in the off-exhibit runs from 1951 through 1959). Other significant Parrot House rearings included a further 19 Swainson's Lorikeets, 13 Hawk-headed Parrots *Deroptyus accipitrinus* and 11 hybrid Scarlet Ara *macao* x Blue and Gold Macaws *A. ararauna* (one of which was hand-raised from the egg).

In 1970 the Parrot House was converted to studio space for the zoo's Design Department (Ross, 1997). Some of the inhabitants were accommodated in the Perching Bird House and other exhibits, but the greater portion of the parrot collection was dispersed. A pair of Hyacinth Macaws *Anodorhynchus hyacinthinus*, which had hatched a chick that lived only two days in 1969, was sold to Ralph Small, Parrot House keeper since 1961. The first fully successful breeding of this species took place in his basement in 1971 (Prestwich, 1971; Low, 1980). This was followed by five more through 1973 (Low, 1980). The first successful zoo breeding in the USA did not occur until 1975 (Brookfield's unsuccessful 1969 breeding was not reported to the *International Zoo Yearbook*).

A male Lear's Macaw *A. leari*, estimated to have hatched in 1946, was loaned to the San Diego Zoo in 1970 where it died in 1978 (W. Schulenburg pers. comm.). The female with which it had been paired, property of the Los Angeles Zoo, was eventually sent to Busch Gardens, Tampa.

A St Vincent Amazon *Amazona guildingii*, loaned to the Houston Zoo, died there some time before 1972 in 'an abortive attempt to sex it by cloacal examination' (Berry, 1981).

Brookfield's role as a major breeder was thus ended, although a number of species continued to breed - most notably Nyasa Lovebirds of which 108

hatched and 101 were reared from 1970 through 1987, according to *International Zoo Yearbook* submissions.

Parrot Jungle and Catalina Bird Park

Two privately owned tourist facilities achieved noteworthy parrot breedings before the 1950s.

Opened in 1936, Parrot Jungle in south Miami, Florida has been one of the least documented bird collections open to the public in the USA. Since Volume 35 of the *International Zoo Yearbook* there have been no submissions to its breeding records or directory of institutions. Since 1991, endangered and threatened taxa have been listed by *ISIS*.

The park was established by Austrian-born Franz Scherr with 25 macaws purchased from a Laredo (Texas) dealer. As of 1992, a Military Macaw *A. militaris* from this consignment was still alive (Clubb and Clubb, 1992). From the beginning a number of macaws were at liberty, conditioned to return to a night house. Birds which formed pairs could be confined in compartments in this facility. The system has been described in detail (Low, 1980; Clubb and Clubb, 1992). Breeding commenced in 1940 with the hatching of hybrid Scarlet x Blue and Gold Macaws. Through 1991, at least 257 macaws were hatched at Parrot Jungle from a total of 52 founders (Clubb and Clubb, 1992). While many were hybrids between Scarlet and Blue and Gold, Military or Buffon's Macaws *A. ambigua*, a number of pure Scarlet and Blue and Gold Macaws were also reared. Five generations of Scarlet and hybrid macaws have been produced.

Hybrids between Scarlet and Blue and Gold Macaws are popularly known, at least to American aviculturists, as Catalina Macaws, in homage to the otherwise largely forgotten Catalina Bird Park on Santa Catalina Island off the coast of California, near Los Angeles. This collection was sold in its entirety to the newly relocated Los Angeles Zoo in 1966.

One of the few published accounts of the collection is that of Jean Delacour (1937) from which the following is extracted: 'Catalina Island is... the property of the Wrigley family (of chewing gum fame) who have developed it into a pleasure resort. The late Mr Wrigley, who was a keen bird fancier, combined his tastes with his interests, and created the bird park both for his amusement and as an attraction to visitors. Since his death it has been maintained mostly for the second reason... It is a walled-in enclosure, with a large and high round-shaped flying cage in front and several paths with rows of aviaries. At the back there is roomy breeding accommodation. The collection of birds is large and general, and contains very good things. There are... a large number of parrots and many small birds, including birds of paradise. Many birds breed, and I noticed some curious hybrids: two beautiful macaws (Blue and Yellow x Red and Blue), a

lovely apricot colour underneath, pale greenish blue above, much prettier than either parent, some lories *Eos bornea* x *Trichoglossus moluccanus*, and Mikado x Swinhoe's Pheasants...'. The first hybrid macaws hatched at Catalina Bird Park in 1931 (Low, 1980).

Busch Gardens

It is interesting to note that while the Catalina Bird Park grew through the interests of the chewing gum manufacturer, William Wrigley, the bird gardens established by a brewer, the late August A. Busch Jr., President and Chairman of Anheuser-Busch Inc from 1946 to 1975, evolved into a major animal collection here in the USA.

In 1959 when a Busch brewery was built in Tampa, Florida, a series of aviaries was established adjacent to that building. Busch Gardens was initially free to the public. Over the next decade a mammal collection was also developed there. By the end of 1970 the park had expanded to nearly 300 acres (approx. 121 hectares), of which the original bird gardens and brewery comprised only a small corner.

By December 1970 there were 722 mammals of 121 species and 1,841 birds of 372 species (Lucas and Duplaix-Hall, 1972). The park had become a major Florida tourist attraction with a commensurate admission charge. By the late 1990s Busch Entertainment Corporation had acquired the four Seaworld Parks as well as a number of other facilities in various states, becoming the 'second largest theme park owner-operator in the world, right behind the Walt Disney Company' (Anon. 1994). It should be noted that in the mid-1990s the Tampa Brewery, now closed, continued to produce nearly three million barrels of Budweiser lager annually (Anon. 1994).

In the midst of all this, Busch Gardens has produced an outstanding number of parrots. The parrot collection began with a large shipment of Australian species procured from August Busch's friend, Roland Lindemann, President and Founder of the Catskill Game Farm (Marvin Jones pers. comm.). At that time, commercial export of Australian birds was still permitted. Busch Gardens contributions to the *International Zoo Yearbook's* breeding records commence in 1963. Through 1994, there were only four years (1969, 1982, 1986 and 1988) when records were not received. The *IZY* listing for Busch Gardens has always been simply 'Tampa USA'. The municipally-owned Lowry Park Zoo, obscure until the 1980s, is listed as 'Tampa LP'. During the 1970s, Busch Gardens were operated in Van Nuys, California and Houston, Texas but were eventually closed, the California facility to make room for a brewery expansion. Over the years covered through Volume 37 of the *IZY*, the breeding of 105 taxa was recorded, a Western Hemisphere record exceeded only by the San Diego Zoo (Table 2).

Most of this propagation took place in an extensive off-exhibit facility

of suspended cages. The hatching of such prodigious numbers of birds as 616 Sun Conures *Aratinga solstitialis*, 403 Jendaya Conures *A. jandaya*, 420 Blue and Gold Macaws (71 hatched in 1994), 211 Scarlet Macaws (32 hatched in 1994) and 51 Green-winged Macaws *Ara chloroptera* (Table 3), was motivated in part by the desire to saturate private aviculture with captive-bred birds, thus reducing the demand for imported specimens. Michael Wells, Busch Gardens' Curator of Birds, informed me that many of these were acquired directly by breeders, becoming a major component of the North American captive population. Of particular interest over this period is the full rearing of 151 endangered Golden Conures *A. guarouba* and 135 vulnerable Golden-capped Conures *A. auricapilla*.

Since the passage of the 1992 Wild Bird Conservation Act ended the commercial importation of parrots into the USA in 1993, Busch Gardens has greatly reduced its parrot breeding efforts. The large off-exhibit breeding facility has been discontinued.

As of mid-1998, the parrot collection consisted of 60 taxa. Among institutions open to the public in the USA, this number was exceeded only by Parrot Jungle with roughly 70 taxa. The *ISIS Bird Abstract* for December 31st, 1997 lists six taxa hatched at Busch Gardens that year: one Forsten's Lorikeet *T.h. forsteni*, three Scarlet Macaws, two Red-cheeked Macaws *A. rubrogenys*, 10 Golden Conures, one Green-thighed Caique *Pionites l. leucogaster* and one Blue-fronted Amazon *Amazona aestiva*.

1959 - 1972

From data collected by the editors of the *International Zoo Yearbook*, it can be seen that the 1960s saw a dramatic and steady growth in parrot breeding in zoos in the USA (Table I). Aside from the aforementioned institutions, few American public collections did much of significance in the 1950s. There is very little documentation. An exception is the Tracy Aviary in Salt Lake City, Utah. Opened in 1939, this municipally operated collection had, by the 1940s, assembled a 'particularly interesting' collection of parrots (Delacour, 1947). When the captive reproduction of Leadbeater's Cockatoos was still an unusual occurrence, an account of Tracy Aviary's initial success with this species was published (Wilson, 1952). One of the very few public collections devoted to birds (Lindholm, 1990), Tracy Aviary ranks among the top nine institutions in the USA submitting records to the *IZY* for the number of taxa bred, with a total of 20 (Table 2).

Four zoos in the USA reported parrot breedings to the *International Zoo Yearbook* for its inaugural volume for 1959. A total of 20 species was bred, mostly by San Diego Zoo. From 1959 through 1968, 35 collections reported breedings with a total of 78 taxa listed (Table I). Until 1966, the number of reporting institutions never exceeded nine but that year it rose to 13 - a

figure below which it has never dropped since. The number of taxa produced each year remained below 40 until 1969 when 49 were hatched (33 being recorded for 1968). Only once, when 48 taxa were reported for 1972, have there been fewer than 52 taxa bred in any subsequent year (Table I).

There are a number of clearly identifiable contributing factors to the increase in zoo propagation in the USA in the 1960s. In 1959, Australia prohibited the commercial export of birds. While zoos were allowed to receive captive-bred specimens under special permit, this was a complicated process. On the other hand private aviculturists, especially in California, made serious efforts to establish Australian species as self-sustaining populations, becoming quite successful with some of the grass parrakeets and rosellas. At any rate, between the overall decreased availability of Australian parrots and the increased production of some species in the private sector, a variety of Australian endemics were bred in zoos in the USA during the 1960s.

Another influence was the change in Indonesian export policies following the overthrow of the Sukarno government in 1965. Prior to this, export of wildlife appears to have been strictly regulated. For example, San Diego Zoo was allowed to import only two pairs of Rothschild's Mynahs *Leucopsar rothschildi* under special permit in 1961 (Lint et al. 1990; Lindholm, 1996). However, by the end of the decade hundreds of these birds were being exported each year. Apparently, the infamous President Sukarno held a personal aversion to the animal trade (Ryhiner and Mannix, 1958). In the mid and late 1960s, large numbers of Lesser Sunda and Moluccan parrots entered the international market and a number of these were bred in American zoos at this time (Table 3).

Although Brazil prohibited bird exports after 1967, South American imports in general, as well as those from India and Thailand, were arriving in the USA at peak levels in the 1960s, resulting in such species as the Nanday Conure *Nandayus nenday* and various *Psittacula* parrakeets being bred in American zoos during this period.

There were some efforts towards breeding endangered taxa. San Diego achieved the first captive breeding of Thick-billed Parrot *Rhynchopsitta pachyrhyncha* in 1965 (Lint, 1966), an event greeted with much fanfare including an Edward H. Bean award from the American Zoo and Aquarium Association. This success was very shortly followed by Los Angeles Zoo and the Arizona-Sonora Desert Museum. San Diego bred the Scarlet-chested Grass Parrakeet *N. splendida* in 1966, the first zoo success in the USA, while Busch Gardens and the Woodland Park Zoo, Seattle hatched Turquoise Grass Parrakeets *N. pulchella* before either species had become commonplace in aviculture.

On the whole, however, breeding results were not consistent. From Table

3 it can be seen that many species hatched in the 1960s were produced only sporadically. Parrot exhibits in zoos in the USA often tended towards multi-species displays containing whatever birds the opportunity might present. At a time when enormous numbers of Asian and Neotropical birds arrived in the USA in continuous importations, there was little impetus for zoos to make any serious attempt to breed parrots.

This situation was suddenly altered in 1972 when, in response to outbreaks of Newcastle disease in 1971, the United States Government imposed a year-long moratorium on bird imports followed by strict quarantine requirements for all subsequent importations. The resulting dramatic increase in bird prices had a profound effect on private and zoo aviculture.

1973 - 1993

From 1959 through 1972, 51 zoos in the USA reported breeding a total of 110 taxa of parrots (Table I). From 1973 through 1994, a further 71 institutions reported breedings to the IZY and 93 additional parrot taxa were recorded. In 1972, 24 institutions reported parrot breedings with 48 taxa recorded. In 1973, the number of institutions fell to 17 but 55 taxa were produced. In 1974, the number of reporting institutions again stood at 24. Over the next two decades this number fairly steadily increased to double. On the other hand, the annual total of taxa has been more erratic (Table I).

While the 1970s saw the closing of the Indian and Thai commercial bird trades, continuing expansion of the Indonesian market significantly affected American zoo collections. Prior to the late 1970s, many New Guinea parrots were available only through special export from Papua New Guinea. For some years the only Pesquet's Parrots *Psittirichas fulgidus*, Stella's Lorikeet *Charmosyna papou goliathina* and fig parrots in North America were at San Diego, exported from Papua through the efforts of Sir Edward Hallstrom. The arrival of these and other taxa as commercial importations from Irian Jaya, commencing in 1978, was unexpected. The effect on American zoo parrot breeding was soon apparent. In 1979 alone, the first hatchings of Duivenbode's Lory *C. duivenbodei*, Stella's Lorikeet and Pesquet's Parrot took place, all followed by a number of further successes (Table 3).

Just before Goldie's Lorikeets became commercially available, San Diego Zoo received a pair in 1976, with a shipment of birds of paradise from the Baiyer River Sanctuary in Papua, through the special arrangements of K. C. Lint. This pair produced a chick in 1978 (Low, 1980), the first in the USA since the last had hatched at Brookfield (from parents obtained from Sir Edward Halstrom) before 1959. It is startling to note that this species became the second most abundantly produced lory or lorikeet (after Swainson's Lorikeet) in the 1959-94 IZY listings (Table 3). Unlike a number of other Indonesian imports, it continues to flourish in zoos in the USA. ISIS reports

that in 1997, 18 hatched at San Diego Zoo, and one at Kansas City. At the same time, this species has gone from being non-existent in American private aviculture in 1977, to being considered a 'beginner's' lorikeet. While the Green-naped Lorikeet *T. h. haematodus* was bred in zoos here as early as 1975 (Table 3), perhaps from Moluccan specimens, it was a rare bird in the USA until the Irian Jaya shipments became frequent at the end of the 1970s. By the late 1980s this taxa was a standard pet store bird, as well as becoming a mainstay of the public feeding enclosures for lorikeets which came into vogue in American zoos in the 1980s. From having a comparatively short zoo history in the USA, it has been a particularly prolific race of *T. haematodus*, and has eclipsed all others at present. *ISIS* reports that in 1997 a total of 12 was produced between Mesker Park Zoo, in Evansville, San Antonio Zoo, Tracy Aviary and Reid Park Zoo, in Tucson. Otherwise, only single specimens of *T. h. forsteni* and *T. h. rubritorquus* were hatched at Busch Gardens and San Diego Zoo, respectively, while two *T. h. moluccanus* were hatched at the Roger Williams Park Zoo in Providence.

At the same time a great range of parrots from elsewhere in Indonesia were imported into the USA in large quantities. The exploitation of such species as Black-winged Lory *E. cyanogenia*, Blue-streaked Lory *E. reticulata* and Goffin's Cockatoo *C. goffini*, Umbrella Cockatoo *C. alba*, Salmon-crested Cockatoo *C. moluccensis* and Lesser Sulphur-crested Cockatoo *C. sulphurea*, resulted in great concern for the status of these species, none of which had been considered in jeopardy before the 1970s. The Salmon-crested Cockatoo, in particular, experienced so precipitous a decline that in 1988 the Fauna Preservation Society declared it one of the 10 animals and plants in greatest danger of extinction.

This led to its placement on Appendix I of CITES, thus prohibiting commercial trade. Up to when this ban went into effect in late 1989, thousands continued to be trapped annually, and large shipments entered American importers' stations until that date. Most of these birds were acquired by private breeders. While it seems anomalous that, as of 1998, captive-bred Salmon-crested Cockatoos were routinely offered on breeder's price lists at significantly lower prices than Galahs *Eolophus roseicapillus* and a fraction of the price of the traditionally more easily bred Leadbeater's Cockatoo, this is hopefully indicative of healthy current levels of captive breeding. Rosemary Low (1997), however, warns 'the Moluccan Cockatoo is an example of a species which will die out in aviculture in the USA if breeders persist in hand-rearing all the young. Breeding successes with hand-reared males are almost non-existent'. While *ISIS* indicates that 119 specimens were distributed among 52 zoos in the USA at the end of 1997, no breedings appear to have taken place that year. On the other hand, over the 37 years covered by the *IZY* breeding records (Table 3), the 77 Salmon-

crested Cockatoos hatched (with 51 surviving), make it the third most prolific Cockatoo (after the Galah and Leadbeater's Cockatoo) in zoos in the USA, while the number of participating collections (14) ranks only behind the 20 for the Galah.

At the same time that this exploitation of Indonesian parrots was proceeding at full blast, similarly disturbing developments took place in South America. Although several countries, most notably Brazil, in 1967, had prohibited the commercial export of birds, by the 1980s others began large-scale exportation of species with little or no avicultural history. Two Bolivian endemics appeared for the first time in the 1970s. The Blue-throated or Caninde Macaw *A. glaucogularis* was an enigma, with no clear understanding of its range or taxonomic status when Forshaw (1973) published his monograph. By the late 1970s, living specimens had arrived in both Europe and America. In 1981, it is estimated eleven per cent of the wild population was collected for export (Low, 1984).

The Red-cheeked Macaw had long been 'one of the least known of all South American parrots' (Forshaw, 1973). In 1973 the first captive specimens were exported. By the early 1980s when the species began to appear in American zoos, hundreds were exported annually, from a population estimated at between 3,000 to 5,000 (Low, 1984).

Though certainly not a threatened or little-known species, the Sun Conure was, for most of this century, an extreme avicultural rarity, despite being one of the first New World parrots hatched in captivity in 1883 (Hopkinson, 1926). I know of none in American zoos prior to the 1970s. Commercial imports from Guyana and Surinam began in that decade. Zoo breedings in the USA commenced in 1975, when it was hatched in Denver, and have continued every year since then. The 1,214 birds (of which only 126 failed to survive) bred among 23 zoos from 1975 through 1994, make this the most prolific parrot taxon in zoos in the USA, as recorded in Volumes 1-35 of the *International Zoo Yearbook* (Table 3). Only the Cockatiel, Peach-faced Lovebird, Blue and Gold, and Scarlet Macaws were produced by more zoos in the USA over this 36 year period. This explosive production has had a definite effect on the zoo propagation of other parrots, especially New World species. Formerly commonly-bred species such as Jandaya and Nanday Conures, the Orange-fronted or 'Halfmoon' Conure *A. canicularis* and Patagonian Conure *Cyanoliseus patagonus* all appear to have been displaced by Sun Conures (Table 3).

It was only to be expected that such widespread commercial exploitation of wild parrots would lead to legislative restrictions. In 1992, the United States Government passed the Wild Bird Conservation Act which went into effect a year later. This prohibited the commercial importation of all bird taxa listed on any appendix of CITES, with the exception of 'gamebirds'.

As almost all parrots had been placed on CITES Appendix II (requiring documentation of international shipments) in 1981, the commercial shipment of wild-caught parrots to the USA effectively ended in 1993. Allowance was made for special importation by zoos and breeding consortiums, but the application process is lengthy, and arrangements for importation and quarantine, without the infrastructure of the commercial importers can be most complicated.

While the 1992 Wild Bird Conservation Act's prohibition of commercial parrot shipments acted as another impetus towards zoo parrot breedings, at the same time other factors had already facilitated such programmes. A major innovation was the provision of various techniques for sexing monomorphic birds. In the early 1980s, these were still in development, but by the end of that decade surgical laparoscopy had become routine, and such non-invasive procedures as the analysis of blood-feathers were widely available.

In particular, this led to a dramatic increase in zoo macaw breedings. From 1959 through 1968, only four collections in the USA reported hatchings of Blue and Gold Macaws to the *International Zoo Yearbook*. No hatchings occurred from 1960 through 1963. Of the 18 chicks hatched in that decade, 13 were produced at Busch Gardens. In this same period, Scarlet Macaws were only bred in 1968, three being hatched at Busch Gardens. For the total period 1959 through 1994, the *IZY* records 1,014 Blue and Gold Macaws hatched among 47 zoos in the USA (Table 3), the largest number of institutions recorded for any parrot. The total for Scarlet Macaws is 612 among 28 zoos, putting this species in second place among parrots for the number of institutions breeding it. No Green-winged Macaws hatched in zoos in the USA prior to 1979. From that year through 1994, 188 were hatched among 16 zoos. Another result of the ability to determine the sex of macaws was the cessation of production of hybrids in American zoos after 1985 (Table 3).

The increase in breedings of macaws - as well as cockatoos, eclectus, Amazons and other species - in the 1980s coincided with a dramatic expansion of private sector breedings, resulting in an American cottage industry producing hand-raised pet birds. By the late 1980s this led to a near saturation of the pet market which, in turn, resulted in a reduced emphasis on parrot breeding by a number of zoos. Several that had achieved consistent success in breeding parrots, such as Brownsville, Cincinnati, Fort Worth, Houston, Los Angeles and Oklahoma City (Table 2), have since reduced their parrot collections and shifted their emphasis towards propagating hornbills, owls or other birds less likely to be worked with by private aviculturists.

Other institutions, while continuing to specialize in parrots, have refined

their collections. At the time the Newcastle disease importation ban went into effect in 1972, there were approximately 200 taxa of parrots at the San Diego Zoo. From 1976, when Arthur Risser succeeded K.C. Lint as Curator of Birds, the encyclopedic 'stamp collection' aspect was de-emphasized. Aviaries full of mixed species groups were phased out, with many surplus species being transferred to breeding situations elsewhere. While there remained a focus on lorries and lorikeets, Neotropical species and cockatoos, which had not bred for some years, were again the target of propagation.

As with other zoos, a new emphasis was placed on softbills in the late 1980s, especially following James Dolan's appointment as Collections Director in 1986. As Assistant Curator of Birds in the 1960s he did much to expand the parrot collection to its peak numbers, concentrating especially on Pacific species. In the 1980s, however, exhibits of the more aviculturally familiar taxa were replaced with extensive series of fruit pigeons, hornbills, cotingas and laughing thrushes. At the same time, unusual parrot taxa continued to be added and bred. As noted earlier, the total number of parrot taxa bred at San Diego from the 1920s through 1968 came to 69 (Dolan and Moran, 1970). Over the 36 years covered by *International Zoo Yearbook* breeding records, 1984 was the only year the San Diego Zoo failed to submit statistics. Considering the magnitude of the collection, it is not surprising that occasional omissions should have occurred. The breeding of Green-winged King Parrots *Alisterus chloropterus callopterus* in 1967 and 1968 (Dolan and Moran, 1970) does not appear in the *IZY* records. The total number of parrot taxa reported to the *IZY* as having hatched at the San Diego Zoo from 1959 through 1994 is 125 (Table 2), by far the largest for a collection in the USA in that period. As of December 31st, 1997, *ISIS* indicated 50 taxa of parrots at San Diego with 15 hatched that year, among them 10 taxa of lorries and lorikeets including a Purple-naped Lory *Lorius domicellus* and 13 Blue-crowned Lorries *Vini australis*, two Pesquet's Parrots and six Cuban Amazons *A. leucocephala*.

Breeding Programmes for Threatened Parrots

The 1970s and '80s saw various attempts at establishing programmes for parrot taxa of conservation concern. While the aforementioned loan of Lear's Macaws from Brookfield and Los Angeles to San Diego in 1970 did not result in breeding, the subsequent loan of a bird from Parrot Jungle to Busch Gardens did produce the first captive-bred chicks (Low, 1984 and Bish, 1985), although at present only female Lear's Macaws remain in the USA at Busch Gardens. Co-operation between the Bronx, National, Brookfield and Houston zoos led to the first captive breeding of the St. Vincent Amazon *A. guildingii* in 1972 (Berry, 1981). While there have not been further zoo successes through 1998, there exists an AZA Species

Survival Plan for this bird, actively concentrating on work with captive specimens in St. Vincent and field research (Bruning, 1996). The San Diego Zoo embarked on a breeding programme for the Tahiti Lory *V. peruviana* with smuggled birds seized by the US Government in 1978 (Low, 1984).

Despite the production of an impressive number of birds (68 hatched over a 13 year period from 1978 through 1995 (Table 3), the captive population has remained small, *ISIS* listing nine specimens at San Diego Zoo and one at the San Diego Wild Animal Park as of December 31st, 1997, with none hatched that year. 'Salmonella, sarcocystis, a variety of bacterial infections and incompatibility have all been challenges' (Schulenburg, 1997). On the other hand the work undertaken with this species has led to the Zoological Society of San Diego's involvement in a variety of projects concerned with *Vini* lories in French Polynesia.

While the New York Zoological Society (now the Wildlife Conservation Society) had not previously devoted major efforts to propagating parrots, remarkable successes were achieved following the establishment of the Wildlife Survival Centre on St. Catherine's Island, off the coast of Georgia, in 1974.

The first parrots bred there were Leadbeater's Cockatoos in 1978. From Table 3 it can be seen that the centre (listed by the *International Zoo Yearbook* as 'NY Bronx SCWCC') had, far and away, led in US zoo production of Leadbeater's Cockatoos, Pesquet's Parrots, Blue-throated and Red-cheeked Macaws. In addition, significant work has been done there with Palm Cockatoos *Probosciger aterrimus* and Yellow-shouldered Amazons *A. barbadensis*.

A 1980's innovation was US administered studbooks for threatened parrots. The confiscation by the US Fish and Wildlife Service of over 100 Palm Cockatoos in 1983 (Young, 1986) led to the formation of a zoo consortium and resulting studbook. (US Government confiscations had a pronounced effect on zoo parrot breeding. Many of the *Eclectus* produced from the 1980s onward were descendents of seized birds and most of the Australian endemics hatched at Los Angeles in this period were of similar origins). A Palm Cockatoo AZA Species Survival Programme subsequently developed.

Following imposition of the Newcastle disease ban and subsequent quarantine, the bird collection at the Sacramento Zoo in California became focused on parrot propagation, resulting in the zoo becoming a leading institution in such efforts (Table 2). Four Thick-billed Parrots were acquired in 1975 and breeding commenced in 1977. Over the period covered by Volumes 1 - 35 of the *IZY*, Sacramento hatched 43, failing to raise only three, over 13 years, making it the most successful propagator of this species among the 11 collections in the USA listed as having hatched it (Table 3).

Susan Healy, long-time Bird Supervisor at Sacramento, began preparing data for a regional studbook in 1984, publishing the first edition in 1988 (Healy, 1998), the same year that the American Zoo and Aquarium Association approved a Species Survival Programme for Thick-bills. She has been the SSP Co-ordinator ever since. Because this is the only extant parrot species with a historical range in the continental USA, there has been great interest both in preserving the remaining Mexican populations and reintroducing it to former habitats in the USA, although involved attempts at the latter have met with little success so far (Snyder et al. 1994). Thus this SSP is heavily involved in *in situ* projects (Healy, 1998).

The first edition of the Golden Conure regional studbook was published in 1990 (Lieberman, 1993), while a regional one for Hyacinth Macaw appeared that same year. Both are notable for their attempts to include private aviculturists. As of April 8th, 1998, there existed AZA approved studbooks for 12 species of parrots (Boyd, 1998). In addition to the previously mentioned Species Survival Plans for Palm Cockatoo, Thick-billed Parrot and St. Vincent Amazon, there is a newly established one for the Red-browed Amazon *A. rhodocorytha*, a species held almost entirely in private aviculture but managed through the Palm Beach Zoo. In addition, an AZA-recognised Breeding Consortium was organised for the Cuban Amazon following a government seizure of illegally imported birds (Boyd, 1998).

Parrot Taxon Advisory Group

With such programmes established it was natural that when the American Zoo and Aquarium Association instituted Taxon Advisory Groups in 1991, an inaugural one was formed for parrots.

From its inception, the Parrot TAG has taken private aviculture very much into consideration. 'Parrots represent a unique set of taxa that differ fundamentally from other animals under AZA administration. Foremost, they are found in greater numbers and diversity outside AZA collections, yet have a very broad appeal for exhibits, research and conservation perspectives for AZA member institutions. The disproportionate representation of parrots in private hands imposes many management considerations unique to this group. The TAG is taking a leadership role in establishing methods to collaborate with private individuals and their organisations. Additionally, the Parrot TAG has the opportunity to be formative in scope by overseeing private/public co-operation in newly managed programmes and in the development of many more such programmes (Bruning, 1997).

The initial Chairman of the Parrot TAG was Alan Lieberman, Curator of Birds at the San Diego Zoo. Following his move to Hawaii to direct the

Peregine Fund's Hawaii Endangered Species Programme, the Chair was assumed by Dr Donald Bruning, Chairman of the Department of Ornithology, the Wildlife Conservation Society/Bronx Zoo. At the AZA National Conference in Seattle in 1995, Dr Bruning oversaw the formation of sub-groups representing various taxonomic divisions. As of 1998, there are 11 sub-groups, each with its Chair and/or Vice-Chair, and a panel of advisors drawn from both the zoo community and private aviculture (Bruning 1997). February 13th-16th, 1997, 14 members of the TAG met at White Oak Plantation in Florida to draft a North American Regional Collection Plan to serve as a guideline for parrot aviculture in American zoos. The mission statement of this plan is as follows (Bruning, 1997):

- 1) Promoting excellence in parrot husbandry and management
- 2) Creating links between the zoological avicultural and conservation communities
- 3) Preserving and restoring parrots and their habitat
- 4) Studying parrot populations and biology
- 5) Educating people about parrots
- 6) Opposing trade in wild-caught parrots

The Regional Collection Plan recommendations for lories and lorikeets include the designation of the Collared Lory *Phigys solitarius* as a candidate for a Population Management Plan to ensure a zoo-based, self-sustaining captive population. The Tahiti Lory was designated a Model Population for research purposes to hopefully eventually develop into a PMP. The Blue-crowned Lory and Iris Lorikeet *Trichoglossus iris* are presently species to be phased-in to collections in the USA with the goal of creating PMPs. *In situ* efforts were recommended for *V. ultramarinus* and *V. kuhli*.

Stable Population status (implying a less urgent status than that for PMP species, with more reliance on private aviculture as a source for zoo specimens) was recommended for the Red Lory *Eos bornea*, Blue-streaked Lory, Chattering Lory *Lorius garrulus*, Purple-naped Lory and Dusky Lory *Pseudeos fuscata*, although with provision that the two *Lorius* species might be upgraded to PMP status. Educational/Display status was recommended for Goldie's Lorikeet and all forms of Rainbow Lorikeets (*T. haematodus*), on the understanding that zoos may procure specimens from private aviculture and need not devote efforts to maintaining a zoo-based population. All other species of lories and lorikeets were not recommended for management, or suggested for display purposes only, pending further discussion.

Seven taxa of Indonesian *Cacatua* are recommended for Population Management Plans with an emphasis on parent-rearing. *In situ* efforts and involvement in private aviculture programmes are also suggested. While there are presently few Red-vented Cockatoos *C. haematuropygia* in zoos

in the USA, this critically endangered Philippine endemic is recommended to be phased into a PMP with *in situ* programmes as well. Australian species are largely de-emphasized. The Galah, which has been bred more often than any other cockatoo in American zoos (Table 3), is recommended to be phased-out to make space for conservation-significant taxa. Of the Australian members of *Cacatua*, only Leadbeater's Cockatoo is recommended for management, and that only at Stable Population level. The Gang Gang *Callocephalon fimbriatum* and an undesigned taxon of *Calyptorhynchus* are suggested as model populations to be maintained for study by a small number of zoos. As part of the on-going Species Survival Plan for Palm Cockatoos, an investigation of subspecies determination through DNA analysis is urged, together with field work. For practical purposes, the Kea *Nestor notabilis* is considered, in the Regional Collection Plan, under the Cockatoo sub-group and is recommended as a Stable Population of 20 or 30 specimens to be held by about a dozen North American zoos (Bruning, 1997).

As can be seen from Table 3, there has been a long-standing problem with Eclectus management in zoos in the USA with many collections of breeding birds of undesigned or misidentified races. The Regional Collection Plan recommends for Population Management Plans only clearly identified specimens of the North Moluccan *E. roratus vosmaeri* and Solomon Island *E. r. solomonensis* races.

Two genera which have no reproductive history in zoos here are recommended for being phased-in as Model Populations: both the Great-billed *Tanygnathus megalorhynchus* and Muller's Parrots *T. sumatranus*, and an undesigned species of Racket-tailed Parrot *Prioniturus* spp. Although three species of fig parrots have been bred in zoos in the USA (Table 3), following their commercial availability from Indonesia commencing in the late 1970s, since the passage of the Wild Bird Conservation Act zoo stocks have declined to near-extinction. Only a single Edward's Fig Parrot *Psittaculirostris edwardsii* was hatched in an American zoo in 1997, at San Diego. TAG proposals for fig parrots include the initiation of a 'private sector studbook', *in situ* studies, the designation of Model Population status for any species available to zoos, with an emphasis on Edward's Fig Parrot. A special importation, under the provisions of the Wild Bird Conservation Act, in conjunction with private aviculturists, is advised.

Another parrot commercially available from Indonesian New Guinea, which showed promise as a zoo-propagated species only to falter, is the Pesquet's or Vulturine Parrot. Prior to its appearance in commercial shipments in the late 1970s it had been represented in American aviculture by a handful of birds obtained at various times by the San Diego and Bronx Zoos. As can be seen from Table 3, four collections hatched this species

over an 11-year period. There was much initial difficulty in rearing chicks but eventual success was achieved with 27 specimens reared at that time. However, no further hatchings occurred until San Diego again succeeded in 1997. There are plans to import both captive-bred and wild-caught currently captive specimens. TAG recommendations include an internationally-managed Population Management Plan for this threatened bird as well as *in situ* work.

A model programme for about 30 specimens of a race of the Shining Parrot *Prosopieia tabuensis*, to be phased-in, is also proposed. The TAG also suggests model populations, with a studbook, for two races of Green-winged King Parrot *A. c. chloropterus* and *A. c. mozskowskii*, as well as a PMP for Amboina King Parrots *A. amboinensis*.

It is recommended that the remaining Australian King Parrots in zoos in the USA be phased out. This is the case for most Australian endemics, except where specimens (to be obtained from private aviculture) may be needed for display in Australian-themed exhibits. At any rate, breeding programmes are not encouraged. Exceptions are the Turquoise and Scarlet-chested Grass Parrakeets, for which stable zoo populations are suggested, as there is concern that the populations in private aviculture are becoming saturated with mutations. All three species of *Polytelis* are recommended as stable populations for display. Finally, the Hooded Parrakeet *Psephotus chrysopterygius* is suggested as a possible candidate for a Population Management Plan, pending investigations as to the purity of the existing population in the USA (Bruning, 1997).

While it is recommended that the Long-tailed Parrakeet *Psittacula longicauda*, of which ISIS listed three specimens in two institutions in the USA on December 31st, 1997, be eventually phased-in as a model population, the Derbyan Parrakeet *P. derbiana* is designated only for education and display. Because of its usefulness in softbill communities, the Blue-crowned Hanging Parrot *Loriculus galgulus* is recommended to be managed for display purposes as a Population Management Plan, with a studbook, with the zoo population to be held at 120. If a hanging parrot of greater conservation concern should become available, then it might replace *L. galgulus*.

A studbook is suggested for the Black-cheeked Lovebird *Agapornis nigrigenis* designated for a PMP. Fischer's Lovebird *A. fischeri*, which appears to have suffered recently from trapping for export, is recommended for a Stable Population, but only if it can be determined that zoos hold genetically pure stock (much of the aviary strains here being contaminated with Masked Lovebird genes). A studbook is recommended for both Vasa Parrots *Coracopsis* spp. On the other hand, zoos in the USA are urged not to breed African Grey Parrots *Psittacus erithacus*, but to maintain them

only for display and education purposes, as there are large numbers bred annually by private aviculturists.

The Hyacinth Macaw is recommended for a SSP. Blue-throated and Red-cheeked Macaws are suggested for immediate Population Management Plan status, while Buffon's Macaw *Ara ambigua*, Yellow-collared Macaw *A. auricollis* and Illiger's Macaw *A. macarana* may eventually follow. The Chestnut-fronted Macaw *A. severa* and Military Macaw are recommended as model populations. The question of whether there are recognizable races of the Scarlet Macaw will be investigated. This species is designated for Stable Population status, with eventually fewer numbers in zoos than at present. The Blue and Gold Macaw, bred by more zoos in the USA than any other parrot, and exceeded in numbers hatched only by the Sun Conure (Table 3), is listed for eventual phasing-out, along with the Green-winged Macaw, both to be replaced by conservation-priority macaws.

The Sun Conure is recommended as a Display Population, with breeding severely curtailed. The Thick-billed Parrot's intensive SSP programme will, of course, continue, while the Golden Conure will be managed under a PMP. Model Population status is recommended for the Blue-headed Conure *A. acuticauda*, a species almost unknown in aviculture until it was imported in quantity during the 1980s, and the Painted Conure *Pyrrhura p. picta*, produced in numbers by San Antonio Zoo until 1993 (Table 3) but not recently. None of the other conures are suggested for any sort of zoo breeding programme. *In situ* projects are recommended for the Orange-fronted or Halfmoon Conure *Aratinga canicularis eburnirostrum*, Hispaniolan Conure *A. chloroptera* and Golden-capped Conure. The Nanday Conure, Patagonian Conure *Cyanoliseus patagonus* and Monk Parrot *Myiopsitta monachus* are all listed for eventual phasing-out. Other species of conures may be considered for zoo programmes if the TAG is so advised by private aviculturists.

A model population of one or two species of *Forpus* parrotlets is recommended, in co-ordination with private aviculture. Any zoo programmes for *Pionus* species await advice from aviculturists. Both species of caiques *Pionites* spp. are suggested as exhibit populations. The Hawk-headed Parrot *Deroptyus accipitrinus*, for which a studbook has already been published (Rhoades, 1992), is designated for a PMP.

Population Management Plan status is recommended for the Yellow-shouldered Amazon *Amazona barbadensis*, Bodin's Amazon *A. festiva bodini*, Cuban Amazon, Vinaceous Amazon *A. vinacea*, Green-cheeked Amazon *A. viridigenalis* and Yellow-headed Amazon *A. oratrix*, with an investigation of the taxonomy of the last species. Stable Population status is suggested for the White-fronted Amazon *A. albifrons*, Yellow-cheeked Amazon *A. a. autumnalis*, Mealy Amazon *A. farinosa*, Finsch's Amazon *A.*

finschi, Yellow-naped Amazon *A. auropalliata* and Yellow-crowned Amazon *A. ochrocephala*, again with an investigation of the taxonomy of captive specimens of the last species. Model Population status is suggested for the Black-billed Amazon *A. agilis*, Yellow-billed Amazon *A. collaria*, Festive Amazon *A. f. festiva*, Tucuman Amazon *A. tucumana* and Hispaniolan Amazon *A. ventralis*. SSP status will continue for the St. Vincent and Red-browed Amazons. A phase-in programme, eventually resulting in a PMP is suggested for the Blue-cheeked Amazon *A. dufresniana*. On the other hand, phase-out programmes are recommended for the Blue-fronted Amazon and Orange-winged Amazon *A. amazonica*.

The Regional Collection Plan for parrots is intended to be flexible, reflecting changes in conservation status and aviculture. It is thus planned that participants will meet regularly to review and consider recommendations. By co-ordinating efforts with American private aviculturists, instead of duplicating them, and focusing their own unique resources on *in situ* projects and the propagation of taxa not readily available to, or impractical for, private aviculture, with attendant research, zoos in the USA will have a positive effect through their parrot programmes.

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Table 1.

Years covered by the *International Zoo Yearbook*, Volumes 1-35.

- A. Number of US institutions submitting parrot breedings.
 B. Number of parrot taxa bred each year.
 C. Institutions first reporting for that year.
 D. Taxa of parrots first bred that year.

	A	B	C	D		A	B	C	D
1959	4	20	4	20	1977	30	59	2	3
1960	4	25	3	9	1978	32	60	2	4
1961	6	9	3	2	1979	31	70	5	9
1962	9	26	3	6	1980	36	74	3	5
1963	6	28	5	10	1981	50	75	5	5
1964	9	37	2	8	1982	42	69	2	5
1965	8	29	2	5	1983	49	89	3	10
1966	13	30	6	8	1984	48	84	1	6
1967	14	31	4	5	1985	51	93	2	3
1968	17	33	3	5	1986	56	73	3	5
1969	19	49	4	10	1987	56	85	4	2
1970	15	52	2	13	1988	47	68	2	0
1971	18	54	3	4	1989	58	95	2	4
1972	24	48	7	5	1990	52	83	2	3
1973	17	55	2	7	1991	49	89	3	3
1974	24	56	5	2	1992	47	90	4	2
1975	32	69	6	8	1993	55	83	1	4
1976	37	60	8	2	1994	55	74	4	1

Table 2.

Zoos in the USA which hatched 10 or more taxa of parrots (excluding hybrids) 1959-1994, compiled from the *International Zoo Yearbook*, Volumes 1-35.

San Diego Zoological Garden	125
Busch Gardens, Tampa	105
Los Angeles Zoo	38
San Antonio Zoo	31
Cincinnati Zoo and Botanical Garden	24
National Aviary at Pittsburgh (formerly Pittsburgh Conservatory Aviary)	21
Central Florida Zoological Park, Lake Monroe	20
Sacramento Zoo	
Tracy Aviary, Salt Lake City	
Riverbanks Zoological Park, Columbia	19
Houston Zoological Gardens	
Phoenix Zoo	
Honolulu Zoo	18
Oklahoma City Zoological Park	17
Sedgwick County Zoo, Wichita	
Memphis Zoo and Aquarium	16
Chicago Zoological Park, Brookfield	15
Cleveland Metroparks Zoological Park	
National Zoological Park	
Fort Worth Zoological Park	14
St Louis Zoological Park	
Gladys Porter Zoo, Brownsville	13
Fort Wayne Children's Zoological Garden	
San Diego Wild Animal Park	11
Woodland Park Zoological Gardens, Seattle	
Denver Zoological Gardens	10

Table 3.

Parrots Hatched in Zoos in the USA, 1959-1994

Compiled from the *International Zoo Yearbook*, Volumes 1-35.

† Figures for leading collections include numbers bred, (DNS) and the number of years for which they were bred

* (Includes specimens listed in *IZY* under other taxa or as unspecified.)

+ indicates unspecified numbers

DNS - did not survive

	Total (DNS)	Years	Collections	† Leading Collections
Black Lory * <i>Chalcopsitta a. atra</i>	47 (13)	1969-71, 1974-75, 1977-80, 1983, 1985-88, 1990-92	2	San Diego: 36(9), 14
Duyvenbode's Lory <i>Chalcopsitta duivenbodei</i>	98 (24)	1979-92	4	San Diego: 56 (17), 9
Yellow-streaked Lory <i>Chalcopsitta sintillata</i>	17 (2)	1982-83, 1985, 1989, 1992	2	San Diego: 15 (1), 3
Black-winged Lory <i>Eos cyanogenia</i>	65 (16)	1982-87, 1989-94	4	San Diego: 26 (4), 7
Violet-necked Lory <i>Eos squamata</i>	7	1979-1981, 1987	3	San Diego: 4, 3
Moluccan Violet-necked Lory * <i>E. s. riciniata</i>	37 (6)	1983, 1989-94	2	Tampa: 35 (4), 6
Blue-streaked Lory <i>Eos reticulata</i>	28 (3)	1979-80, 1984, 1986-90, 1992,	4	Tampa: 12, 2 Toledo:12(2),6
Red Lory <i>Eos bornea</i>	103 (10)	1974-75, 1977-94	9	Pittsburgh Av: 45 (2), 13
Eastern Red Lory * <i>E. b. bornea</i>	23 (20)	1968-70, 1973	1	San Diego
Buru Red Lory <i>E. b. cyanonothus</i>	5	1966, 1977, 1988	2	San Diego
<i>Eos b. bornea</i> x <i>E. cyanogenia</i>	4 (1)	1973	1	San Diego
<i>Eos bornea</i> x <i>Lorius lory salvadorii</i>	1	1966	1	Tampa
Dusky Lory <i>Pseudeos fuscata</i>	104 (12)	1975-76, 1979	7	Tampa: 39 (3), 7
Ornate Lorikeet <i>Trichoglossus ornatus</i>	85 (34)	1968-75, 1989	3	San Diego: 73 (32), 9
Rainbow Lorikeet <i>Trichoglossus haematodus</i>	30 (6)	1972, 1974-76, 1981, 1986-90	7	Memphis: 11 (1), 3
Mitchell's Lorikeet <i>T. h. mitchellii</i>	43 (8)	1974-83, 1985	2	San Diego: 35 (8), 11

Forsten's Lorikeet <i>T. h. forsteni</i>	158 (16)	1966, 1969-94	3	Tampa: 88 (9), 15
Edward's Lorikeet <i>T. h. capistratus</i>	72 (6)	1966-68, 1970-71, 1973, 1975, 1977-79, 1981-85, 1989-94	3	Tampa: 59 (2), 15
Green-naped Rainbow Lorikeet * <i>T. h. haematodus</i>	155 (15)	1975-78, 1982-94	11	Tampa: 60 (10), 6
Black-throated Lorikeet <i>T. h. nigrogularis</i>	10	1969-70, 1974-75	1	San Diego
Coconut Lorikeet <i>T. h. massena</i>	4	1980-81	1	Tampa
New Caledonian Rainbow Lorikeet <i>T. h. deplanchii</i>	10 (9)	1980-82, 1984-85	1	Santa Barbara
Swainson's Lorikeet <i>T. h. moluccanus</i>	199(24)+	1959-81, 1985-87, 1989-94	17	Tampa: 113 (6)+, 23
Red-collared Lorikeet <i>T. h. rubritorquis</i>	90 (23)+	1959-60, 1962, 1969-77, 1989-94	1	San Diego
<i>T. h. mitchellii</i> x <i>T. h. weberi</i>	4 (1)	1972	1	San Diego
<i>T. h. intermedius</i> x <i>T. h. moluccanus</i>	4	1971	1	Tampa
Ponapé Lorikeet <i>Trichoglossus rubiginosus</i>	3 (1)	1970-71	1	Los Angeles
Mount Apo Lorikeet <i>Trichoglossus johnstoniae</i>	24 (7)	1971-75, 1978	1	San Diego
Meyer's Lorikeet <i>Trichoglossus flavoviridis meyeri</i>	23 (3)	1973-78	1	San Diego
Scaly-breasted Lorikeet <i>Trichoglossus chlorolepidotus</i>	177 (35)+	1962-77, 1979-81, 1983-85, 1987, 1989-93	4	Tampa: 102 (15)+, 23
Perfect Lorikeet <i>Trichoglossus euteles</i>	58 (18)	1964-65, 1970-76, 1985, 1991-92, 1994	3	San Diego 48 (18), 10
Iris Lorikeet <i>Trichoglossus iris</i>	31 (6)	1970, 1972, 1975-76, 1978, 1985-86, 1988-89, 1991-93	1	San Diego
Goldie's Lorikeet <i>Trichoglossus goldiei</i>	200 (31)	1978-94	12	San Diego 90 (19), 12
<i>T. h. capistratus</i> x <i>T. chlorolepidotus</i>	2	1970	1	Tampa
<i>T. f. meyeri</i> x <i>T. chlorolepidotus</i>	4 (1)	1972	1	San Diego
<i>T. h. rubritorquis</i> x (<i>E. b. cynonothus</i> x <i>T. h. moluccanus</i>)	+	1973	1	San Diego

Black-capped Lory <i>Lorius lory</i>	71 (12)	1976, 1979, 1982-85, 1987-91, 1993-94	4	Tampa: 39 (2), 9
Blue-thighed Black-capped Lory * <i>L. l. erythrothorax</i>	24 (8)	1967-71, 1973-76	1	San Diego
Salvadori's Black-capped Lory <i>L. l. salvadorii</i>	3 (3)	1973-74	1	San Diego
<i>L. l. lory</i> x <i>L. l. salvadorii</i>	1 (1)	1977	1	Tampa
Purple-naped Lory <i>Lorius domicellus</i>	11 (1)	1969, 1973, 1976-78, 1981, 1984	3	Tampa: 8 (1), 5
Chattering Lory <i>Lorius garrulus</i>	69 (17)	1976-86	5	Memphis: 34 (6), 6
Chattering Lory <i>L. g. garrulus</i>	+	1963	1	Tampa
Yellow-backed Lory * <i>L. g. flavopalliatius</i>	106 (15)	1965, 1967, 1969-75, 1977-87, 1989-94	7	San Diego: 34 (4), 12
<i>L. domicellus</i> x <i>L. garrulus</i>	9 (3)	1967-70	1	Tampa
Collared Lory <i>Phigys solitarius</i>	10	1993-94	1	San Diego
Blue-crowned Lory <i>Vini australis</i>	29 (4)	1973-74, 1992-94	1	San Diego
Tahitian Lory <i>Vini peruviana</i>	73 (33)	1978-83, 1985, 1987-90, 1992-94	3	San Diego: 68 (31), 13
Musk Lorikeet <i>Glossopsitta concinna</i>	20 (8)	1971-75, 1979-80	1	San Diego
Red-flanked Lorikeet <i>Charmosyna p. placensis</i>	14 (5)	1991-93	1	San Diego
Central Stella's Lorikeet * <i>Charmosyna papou goliathina</i>	134 (56)	1979-94	6	San Diego: 86 (39), 15
<i>C. josefinae</i> x <i>C. p. papou</i>	2	1978	1	San Diego
Musschenbroek's Lorikeet <i>Neopsittacus musschenbroekii</i>	2	1991	1	San Diego
Palm Cockatoo <i>Probosciger aterrimus</i>	21 (6)	1986-92, 1994	4	Baton Rouge 12 (2), 6
Red-tailed Cockatoo <i>Calyptorhynchus magnificus</i>	5	1981, 1983, 1985, 1990	3	San Diego: 2, 2 Tampa: 2, 2
Western Red-tailed Cockatoo <i>C. magnificus naso</i>	18 (3)	1982-83, 1986-92, 1994	1	San Diego
Eastern Red-tailed Cockatoo * <i>C. m magnificus</i>	1 +	1959, 1962-63, 1965	1	San Diego
Gang-Gang <i>Callocephalon fimbriatum</i>	9 (1)	1975, 1980, 1983, 1985, 1993-4	2	San Diego: 6 (1), 4

Galah <i>Eolophus roseicapillus</i>	298 (54)+	1963-72, 1977, 1979-94	20	Los Angeles: 43 (2)+, 11
Leadbeater's Cockatoo <i>Cacatua leadbeateri</i>	154 (26)+	1962, 1964-68, 1972, 1976-94,	12	NY Bronx- SCWCC: 48 (8), 13
Lesser Sulphur-crested Cockatoo <i>Cacatua sulphurea</i>	20 (3)	1968, 1974-75, 1981, 1983-84, 1989, 1991, 1993-94	5	Tampa: 13 (1), 7
Citron-crested Cockatoo <i>C. s. citrinocristata</i>	50 (5)	1965-68, 1971, 1973, 1977-79, 1981-94	11	Tampa: 17 (1), 11
Greater Sulphur-crested Cockatoo <i>Cacatua galerita</i>	12	1969-71, 1985, 1991	3	Houston: 8, 3
Aru Island Cockatoo <i>C. g. eleonora</i>	40 (3)	1986-91, 1993-94	3	Memphis: 18 (1), 7 Tampa: 18 (2), 6
Triton Cockatoo * <i>C. g. triton</i>	6 (1)	1983-84, 1991	3	Tampa: 3, 2
Greater Sulphur-crested Cockatoo * <i>C. g. galerita</i>	58 (18)	1966-71, 1973-79, 1981, 1983-85, 1987-94	7	Tuscon RP: 18 (6), 9
Salmon-crested Cockatoo <i>Cacatua moluccensis</i>	77 (26)	1969, 1973, 1976-79, 1982-94	14	Tampa: 28 (5), 8
Umbrella Cockatoo <i>Cacatua alba</i>	29 (8)	1965, 1978-79, 1983-87, 1989, 1991-92, 1994	10	Phoenix: 5, 3 Wichita: 5, 3
Philippine Cockatoo <i>Cacatua haematuropygia</i>	13 (3)	1979-80, 1982, 1991-92	2	Fort Worth: 6 (1), 2 San Diego: 7 (2), 3
Goffin's Cockatoo <i>Cacatua goffini</i>	28 (2)	1990-94	4	Baton Rouge: 15 (1), 4
Bare-eyed Cockatoo <i>Cacatua sanguinea</i>	7 (2)	1984-85, 1987	2	Columbia: 6 (1), 2
Southern Bare-eyed Cockatoo * <i>C. s. sanguinea</i>	57 (14)+	1959-60, 1962, 1964-66, 1968-71, 1974, 1976, 1978-81, 1983-84, 1987, 1989-93	3	Tampa: 51 (14), 20
Long-billed Corella <i>Cacatua tenuirostris</i>	37 (4)+	1959-60, 1963-64, 1981-82, 1985-93	4	San Diego: 18 (2)+, 12
<i>C. l. leadbeateri</i> x <i>C. haematuropygia</i>	1 (1)	1972	1	Tampa
<i>C. sulphurea citrinocristata</i> x <i>C. sanguinea</i>	5 (2)	1976	1	Cincinnati
Cockatiel <i>Nymphicus hollandicus</i>	208 (35)+	1959-77 (No listings by institution after 1977)	22	Tampa: 49 (5)+, 12

Kea <i>Nestor notabilis</i>	45 (18)	1959-60, 1962, 1969, 1971-77, 1979, 1982, 1985-86, 1988-90, 1992-94	5	San Diego WAP: 16 (6), 7
Double-eyed Fig Parrot <i>Opopsitta diophthalma</i>	1 (1)	1970	1	San Diego
Western Double-eyed Fig Parrot <i>O. d. diophthalma</i>	2 (2)	1992	1	San Diego
Desmarest's Fig Parrot <i>Psittaculirostris desmarestii</i>	37 (27)	1981-83, 1986, 1988-94	2	San Diego: 36 (27), 11
Edwards' Fig Parrot <i>Psittaculirostris edwardsii</i>	24 (14)	1989-94	4	Miami MZ: 10 (6), 3
Eclectus <i>Eclectus roratus</i>	271 (25)	1968, 1970-94	20	Columbia: 49 (3), 12
Vosmaer's Eclectus <i>*E. r. vosmaeri</i>	98 (21)	1983-94	7	Baton Rouge: 33 (3), 9
Grand Eclectus <i>*E. r. roratus</i>	212 (22)+	1963, 1970-74, 1982-94	12	Gainesville (FL): 90 (2), 12
Red-sided Eclectus <i>E. r. polychloros</i>	132 (13)+	1959-60, 1962, 1964, 1985-94	6	Baton Rouge : 113 (11), 10
Solomon Eclectus <i>E. r. solomonensis</i>	7+	1960-61, 1963-64, 1966-67	1	San Diego
Pesquet's Parrot <i>Psittichas fulgidus</i>	44 (17)	1979-87, 1989	4	NY Bronx SCWCC: 25 (5), 10
Tabuen Shining Parrot <i>*Prosopeia t. tabuensis</i>	2 (2)	1975, 1977	1	San Diego
Red Shining Parrot <i>Prosopeia splendens</i>	9 (3)	1973-74, 1976, 1978, 1982, 1985	2	San Diego: 5 (3), 4 San Francisco:4, 2
Australian King Parrot <i>Alisterus scapularis</i>	16 (3)+	1959-60, 1963, 1988, 1990-92	3	San Diego: 12 (2)+, 4
Green-winged King Parrot <i>Alisterus chloropterus</i>	5 (5)	1982, 1985	1	Honolulu
Northern Green-winged King Parrot <i>A. chloropterus moszkowskii</i>	2 (1)	1984, 1986	1	Houston
<i>A. chloropterus</i> ssp. x <i>A. chloropterus moszkowskii</i>	4	1984-85	1	Dallas
Amboina King Parrot <i>Alisterus amboinensis</i>	26 (14)	1981-83, 1989	2	San Diego: 21 (10), 4
Crimson-winged Parrot <i>Aprosmictus erythropterus</i>	57 (8)+	1962-65, 1969, 1975-76, 1980-83, 1985-88, 1991-92	8	Tucson RP: 29 (4), 5
Timor Crimson-winged Parrot <i>Aprosmictus jonquillaceus</i>	8+	1983-84	1	Tucson RP

Superb Parrot <i>Polytelis swainsonii</i>	11 (2)	1971, 1973-74, 1986	2	San Diego: 9 (2), 3
Regent Parrot <i>Polytelis anthopeplus</i>	88 (19)+	1960, 1969, 1971-74, 1976-77, 1979-83, 1985-90	3	San Diego: 83 (18)+, 18
Princess Parrot <i>Polytelis alexandrae</i>	53 (13)+	1959-60, 1962-65, 1972-75, 1980-81, 1983, 1985-90, 1992	9	San Diego: 13 (2)+, 8
Red-capped Parrot <i>Purpureicephalus spurius</i>	16 (6)	1972, 1988-90	1	San Diego
Cloncurry Parrot <i>Barnardius barnardi macgillivrayi</i>	4	1983, 1989	1	San Diego
Mallee Ringneck Parrot * <i>B. b. barnardi</i>	12 (4)	1967, 1969, 1983, 1988	3	San Diego : 5 (1), 2
Twenty-eight Parrot <i>Barnardius zonarius semitorquatus</i>	28 (8)	1966, 1979-82, 1984	3	Los Angeles : 20 (7), 5
Port Lincoln Parrot * <i>B. z. zonarius</i>	20 (5)	1964, 1968-70, 1986-88, 1990	3	Salt Lake Tracy: 10 (3), 3
Crimson Rosella <i>Platycercus elegans</i>	23 (6)+	1963-64, 1969, 1971, 1983-84, 1986, 1991-92	4	Tampa: 9 (1)+, 4
Yellow Rosella <i>Platycercus flaveolus</i>	4 (1)+	1962, 1975	1	San Diego
Eastern Rosella <i>Platycercus eximius</i>	77 (14)+	1960, 1964-65, 1967, 1976-77, 1979-87, 1989	10	Tampa: 14 (3), 6
Golden-mantled Rosella <i>P. e. ceciliae</i>	32 (13)+	1963-64, 1972, 1974-76, 1978, 1980, 1984	5	Tampa: 17 (5), 6
Eastern Rosella <i>P. e. eximius</i>	+	1959	1	San Diego
Pale-headed Rosella <i>Platycercus adstictus</i>	11 (2)	1983, 1987-89, 1992, 1994	4	San Diego: 7 (2), 2
Northern Rosella <i>Platycercus venustus</i>	85 (36)+	1959-64, 1977-85, 1989	3	Los Angeles: 67 (32), 9
Western Rosella <i>Platycercus icterotis</i>	41 (15)+	1959, 1975, 1978-82	4	Los Angeles: 23 (17), 3
Red-rumped Parrakeet <i>Psephotus haematonotus</i>	77 (11)+	1962-64, 1966, 1969, 1971-76, 1978-81, 1983, 1985	10	Tampa: 36 (2)+, 7
Mulga Parrakeet <i>Psephotus varius</i>	24 (5)+	1960-64, 1967, 1969-71, 1973-74	2	San Diego: 21 (2)+, 10
Blue Bonnet <i>Psephotus haematogaster</i>	6 (1)	1968, 1970	2	San Diego: 5, 1
Red-vented Blue Bonnet <i>P. haematogaster haematorrhous</i>	8 (2)	1969, 1971	1	San Diego

Yellow-vented Blue Bonnet <i>P. h. haematogaster</i>	3+	1963-64	1	Tampa
Hooded Parrakeet * <i>Psephotus chrysopterygius dissimilis</i>	65 (14)	1978-80, 1983-84, 1986-87, 1989-94	5	San Diego: 33 (5)
Red-fronted Kakariki * <i>Cyanoramphus n. novaezelandiae</i>	65 (16)	1968-70, 1974-76, 1978-80, 1982-85, 1987, 1994	5	San Diego: 41 (7), 10
Yellow-fronted Kakariki * <i>Cyanoramphus a. auriceps</i>	21 (1)	1965-66, 1968-71, 1974	2	San Diego: 20 (1), 6
Bourke's Parrakeet <i>Neophema bourkii</i>	34 (6)+	1969, 1971, 1974-75, 1977-80, 1994	4	San Diego: 24 (6)+, 7
Blue-winged Grass Parrakeet <i>Neophema chrysostoma</i>	9 (1)	1976, 1978, 1988-90	1	San Diego
Elegant Grass Parrakeet <i>Neophema elegans</i>	34 (3)	1970-71, 1973, 1975, 1987-88	2	San Diego: 25 (1), 4
Turquoise Grass Parrakeet <i>Neophema pulchella</i>	110 (14)+	1963, 1967-68, 1970-77, 1980-81, 1983-86, 1988-93	12	Santa Ana: 16 (1), 4 Washington NZP: 16 (3), 3
Scarlet-chested Grass Parrakeet <i>Neophema splendida</i>	181 (56)	1966, 1975, 1979-90, 1992-93	8	San Diego: 88 (30), 11
Swift Parrot <i>Lathamus discolor</i>	5	1970, 1973-74	1	San Diego
Budgerigar * <i>Melopsittacus undulatus</i>	+	1959, 1962 (No intentional listings after 1959)	3	*Merced San Diego Washington NZP
Greater Vasa Parrot <i>Coracopsis vasa</i>	3	1991, 1993	1	Salt Lake Tracy
Lesser Vasa Parrot <i>Coracopsis nigra</i>	5 (2)	1985, 1987	1	Los Angeles
Timneh Grey Parrot <i>Psittacus erithacus timneh</i>	60 (12)	1973-74, 1976-78, 1980-89	3	San Diego : 30 (9), 7
African Grey Parrot * <i>P. e. erithacus</i>	364 (36)+	1960, 1967, 1969-73, 1975-94	21	Tampa: 86 (5), 22
Jardine's Parrot <i>Poicephalus gularis</i>	4	1970-71	1	Tampa
Senegal Parrot <i>Poicephalus senegalus</i>	105 (4)+	1961-75, 1981, 1983-85, 1989-94	3	Tampa: 84 (1), 18
Meyer's Parrot <i>Poicephalus meyeri</i>	44 (3)	1972-73, 1976-80, 1982, 1986-94	3	Sacramento: 24 (2), 12
Ruppell's Parrot <i>Poicephalus rueppellii</i>	15 (1)	1964-65, 1970-73, 1975	1	Tampa
<i>P. cryptoxanthus tanganyikae</i> x <i>P. rueppellii</i>	5 (1)	1971-72	1	Tampa
<i>P. meyeri</i> x <i>P. rueppellii</i>	13 (3)	1966-68	1	Tampa

Madagascar Lovebird <i>Agapornis cana</i>	2	1970	1	San Diego
Eastern Madagascar Lovebird <i>A. c. cana</i>	1	1975	1	San Diego
Black-winged Lovebird <i>Agapornis taranta</i>	38 (7)	1967, 1978-80, 1991-94	1	San Diego
Peach-faced Lovebird <i>Agapornis roseicollis</i>	425 (58)+	1959-60, 1962-76 (No listings by institution after 1977)	25	San Diego: 130 (28)+
Fischer's Lovebird <i>Agapornis fischeri</i>	178 (35)	1966, 1970, 1972-85, 1987-89, 1993	8	San Diego: 91 (7), 6
Masked Lovebird <i>Agapornis personata</i>	112 (11)+	1959-60, 1962-66, 1973-78, 1980, 1983-85, 1992-93	7	San Diego: 63 (2)+
Nyasa Lovebird <i>Agapornis lilianae</i>	388 (59)+	1961-66, 1970-87	4	Chicago Brookfield: 168 (7)+, 19
Black-cheeked Lovebird <i>Agapornis nigrigenis</i>	42 (5)	1970, 1991-94	3	San Diego: 37 (3), 5
<i>A. fischeri</i> x <i>A. roseicollis</i>	1	1984	1	Tampa
<i>A. personata</i> x <i>A. roseicollis</i>	22	1964-65, 1979-80	1	Tampa
Vernal Hanging Parrot <i>Loriculus vernalis</i>	4 (1)	1973, 1975-76	1	San Diego
Philippine Hanging Parrot <i>Loriculus philippensis</i>	4	1964-65	1	Tampa
Blue-crowned Hanging Parrot <i>Loriculus galgulus</i>	170 (64)	1967, 1973, 1975, 1977-78, 1980, 1985-94	12	San Diego: 51 (28), 9
Sulawesi Hanging Parrot <i>Loriculus stigmatus</i>	3 (2)	1994	1	Cincinnati
Alexandrine Parrakeet <i>Psittacula eupatria</i>	23 (1)	1986-88, 1990-94	3	Salt Lake Tracy: 12, 6
Himalayan Alexandrine * <i>P. e. nipalensis</i>	53 (5)	1970, 1973, 1975-77, 1979-89, 1992-94	3	Phoenix: 29 (1), 11
Ring-necked Parrakeet <i>Psittacula krameri</i>	53 (7)	1967, 1969, 1976-78, 1982-84, 1988, 1990-91, 1993-94	11	Dallas: 13 (3), 1
African Ring-necked Parrakeet <i>P. k. krameri</i>	9 (1)	1964, 1971, 1981	3	Lake Monroe: 4, 1
Northern Ring-necked Parrakeet <i>P. krameri borealis</i>	30	1982-85	2	Sacramento: 22, 3
Indian Ring-necked Parrakeet <i>P. k. manillensis</i>	295 (25)+	1960, 1963-87, 1989-91	15	Tampa: 129 (11)+, 21
<i>P. k. krameri</i> x <i>P. krameri manillensis</i>	5	1978	1	Tampa

Plum-headed Parakeet <i>*Psittacula cyanocephala</i>	157 (14)	1964-65, 1967, 1969-70, 1972-85, 1987-88	14	Phoenix: 29 (1), 11
Malabar Parakeet <i>Psittacula columboides</i>	9	1970-71, 1973, 1976	1	San Diego
Derbyan Parakeet <i>Psittacula derbiana</i>	90 (31)	1973-75, 1982-94	5	San Diego: 55 (22), 13
Moustached Parakeet <i>Psittacula alexandri</i>	9 (1)	1985-87	1	Monroe
Mainland Moustached Parakeet <i>*P. alexandri fasciata</i>	135 (13)+	1969, 1971-85, 1989-94	7	Tampa: 84 (8), 17
Andaman Moustached Parakeet <i>P. alexandri abbotti</i>	3	1969, 1972	1	San Diego
Long-tailed Parakeet <i>Psittacula longicauda</i>	9 (1)	1986, 1990	1	Miami MZ
<i>P. calthorpe x P. columboides</i>	3	1978	1	San Diego
Hyacinth Macaw <i>Anodorhynchus hyacinthinus</i>	139 (34)	1975, 1977-78, 1980-94	19	Oklahoma City: 31 (9), 12
Lear's Macaw <i>Anodorhynchus leari</i>	6 (3)	1983-84	1	Tampa
<i>A. hyacinthinus x Ara ararauna</i>	6+	1965-66, 1968-69, 1980	1	Salt Lake Tracy
<i>*Ara sp.</i>	2	1963	1	Los Angeles
Blue and Gold Macaw <i>Ara ararauna</i>	1,014 (146)+	1959, 1964-72, 1974-94	47	Tampa: 420 (46), 27
Caninde Macaw <i>Ara glaucogularis</i>	13 (1)	1989-91, 1993-94	1	NY Bronx SCWCC
Military Macaw <i>Ara militaris</i>	148 (18)	1964, 1977-94	22	Cleveland: 23 (2), 7
Mexican Military Macaw <i>A. m. mexicana</i>	45 (9)	1971, 1979-81, 1983-85, 1987, 1989-91	1	Tampa
Buffon's Macaw <i>Ara ambigua</i>	3 (2)	1984-85	2	Memphis: 2 (2), 1 Tampa: 1, 1
Scarlet Macaw <i>Ara macao</i>	612 (90)	1968-72, 1976-94	28	Tampa: 211 (37), 11
Green-winged Macaw <i>Ara chloroptera</i>	188 (43)	1979-94	16	Tampa: 51 (14), 11
Red-fronted Macaw <i>Ara rubrogenys</i>	159 (20)	1983-94	7	NY Bronx SCWCC: 87 (8), 11
Yellow-collared Macaw <i>Ara auricollis</i>	37 (3)+	1963-65, 1969, 1975, 1979-80, 1983, 1989-91, 1993-94	7	Tampa: 12+, 5

Chestnut-fronted Macaw <i>Ara severa</i>	98 (9)	1969, 1971, 1975, 1977-85, 1987, 1989-94	5	Tampa: 85 (3), 15
Red-bellied Macaw <i>Ara manilata</i>	7 (1)	1986, 1989, 1991-93	3	Lake Monroe: 3, 1 San Diego WAP: 3 (1), 3
Illiger's Macaw <i>Ara maracana</i>	59 (5)	1975-84, 1986-87, 1989	3	Tampa: 39, 11
Red-shouldered Macaw <i>Ara nobilis</i>	1	1976	1	Van Nuys
Hahn's Macaw <i>A. n. nobilis</i>	103 (8)	1978-80, 1983-85, 1987, 1989-94	1	Tampa
<i>A. ararauna</i> x <i>A. chloroptera</i>	4	1971, 1978, 1985	2	Tampa: 3, 2
<i>A. ararauana</i> x <i>A. macao</i>	26 (3)	1964-66, 1968, 1973-76, 1984	4	Baltimore: 14 (3), 4
<i>A. ararauna</i> x <i>A. militaris</i>	2	1972	1	Phoenix Jungle Pk.
<i>A. chloroptera</i> x <i>A. macao</i>	3 (1)	1967, 1979	2	Wichita: 2, 1
<i>A. macao</i> x <i>A. militaris</i>	8	1974-75, 1980, 1984	3	Laguna Hills LCS: 3, 2 Sacramento: 3, 1
Blue-crowned Conure <i>Aratinga acuticaudata</i>	5	1985, 1988	1	Wichita
Golden Conure <i>Aratinga guarouba</i>	350 (102)	1971-94	9	Tampa: 197 (46), 20
'Green Conure' <i>Aratinga</i> sp.	4	1967-68	2	Tampa: 3, 1
Green Conure <i>Aratinga holochlora</i>	1	1977	1	San Diego
Red-throated Green Conure <i>A. h. rubritorquis</i>	7	1992-93	1	Tampa
Finsch's Conure <i>Aratinga finschi</i>	19 (2)	1989-92, 1994	1	Tampa
Mitred Conure <i>Aratinga mitrata</i>	49 (8)	1981, 1983-85, 1987, 1989-94	2	Tampa: 47 (7), 11
Red-masked Conure <i>Aratinga erythrogenys</i>	4 (2)	1984-85	1	Lake Monroe
White-eyed Conure <i>Aratinga leucophthalmus</i>	4	1970, 1984	2	Houston: 3, 1
Eastern White-eyed Conure <i>A. l. leucophthalmus</i>	20+	1963-67, 1969, 1971	1	Tampa
Golden-capped Conure <i>Aratinga auricapilla</i>	151 (8)	1978, 1981, 1983-85, 1987, 1989-94	2	Tampa: 143 (8), 11

Jandaya Conure <i>Aratinga jandaya</i>	527 (76)+	1960-64, 1966-70, 1972-87, 1989-94	15	Tampa: 403 (55), 23
Sun Conure <i>Aratinga solstitialis</i>	1,214 (126)	1975-94	23	Tampa: 616 (52), 16
Aztec Conure <i>Aratinga nana astec</i>	+	1960	1	Mayaguez
Orange-fronted Conure <i>Aratinga canicularis</i>	83 (14)+	1962, 1967-69, 1971-76, 1979-85	7	Cincinnati: 27 (5), 7
Peach-fronted Conure <i>Aratinga a. aurea</i>	3 (2)	1981-82	1	Gainesville (FL)
<i>A. chloroptera</i> x <i>A. jandaya</i>	2 (1)	1970	1	Chicago LP
<i>A. holochlora</i> x <i>A. wedelli</i>	3	1975	1	Tampa
<i>A. canicularis</i> x <i>Nandayus nenday</i>	4	1974	1	New Orleans
Nanday Conure <i>Nandayus nenday</i>	183 (24)	1964-65, 1969-88, 1990-92	21	Tampa: 19, 4
Thick-billed Parrot <i>Rhynchopsitta pachyrhyncha</i>	103 (23)+	1965-68, 1972, 1976-80, 1982-94	11	Sacramento: 43 (3), 13
Patagonian Conure <i>Cyanoliseus patagonus</i>	41 (10)	1968-69, 1971, 1980, 1983-89, 1991, 1993	6	Salt Lake Tracy: 20 (1), 6
* <i>C. p. patagonus</i>	55 (2)	1976-85, 1987-89	5	Sacramento: 21 (1), 5
Maroon-bellied Conure <i>Pyrrhura frontalis</i>	5	1979	1	Monroe
Green-cheeked Conure <i>Pyrrhura molinae</i>	28 (4)	1984-85, 1987, 1990-91	1	Tampa
Guiana Painted Conure <i>Pyrrhura p. picta</i>	89 (10)	1983-90, 1992-93	2	San Antonio: 84 (9), 9
Slender-billed Conure <i>Enicognathus leptorhynchus</i>	25 (1)	1987-91	1	Salt Lake Tracy
Monk Parrot <i>Myiopsitta monachus</i>	297 (37)+	1959-61, 1967-92	21	Seattle WP: 68 (6), 12
Sierra Parakeet <i>Bolborhynchus aymara</i>	1	1966	1	San Diego
Lineolated Parakeet <i>Bolborhynchus lineola</i>	+	1959-60, 1962	1	San Diego
Andean Parakeet <i>Bolborhynchus orbynesius</i>	18 (15)	1984-86	1	Oklahoma City
Mexican Parrotlet <i>Forpus cyanopygius</i>	16 (5)	1969-70, 1984-86	2	Monroe: 8 (3), 3 Washington NZP: 8 (2), 2
Sonoran Parrotlet * <i>F. c. pallidus</i>	14	1976, 1981, 1985	1	Tucson ASDM

Blue-winged Parrotlet <i>Forpus xanthopterygius</i>	8	1981-82	1	Monroe
Pacific Parrotlet <i>Forpus coelestis</i>	96 (33)	1972-74, 1976-77, 1979-86	5	San Diego
Canary-winged Parrakeet <i>*Brotogeris v. versicolorus</i>	17+	1959-60, 1962, 1971-73, 1984	3	Pittsburgh Av: 13, 3
Orange-chinned Parrakeet <i>Brotogeris jugularis</i>	3+	1960, 1962, 1964	1	San Diego
<i>*Pionites</i> sp.	1	1969	1	Memphis
Black-headed Caique <i>Pionites melanocephala</i>	43 (4)	1970-71, 1975-79, 1981-82, 1984, 1986, 1989-90	6	Jackson: 18 (1), 6
White-bellied Caique <i>Pionites leucogaster</i>	10 (1)	1964, 1969-70	2	Tampa: 7, 1
Green-thighed Caique <i>P. l. leucogaster</i>	22	1987, 1989, 1991-94	1	Tampa
Yellow-thighed Caique <i>P. l. xanthomeria</i>	12 (1)	1977, 1988-92	2	Sacramento: 7 (1), 5
<i>P. l. leucogaster</i> x <i>P. l. xanthomeria</i>	42+	1963, 1965, 1967-70, 1975-79	1	Tampa
Blue-headed Parrot <i>Pionus menstruus</i>	46 (8)	1977-82, 1984, 1987, 1989, 1991-93	6	Baltimore: 18, 5
Scaly-headed Parrot <i>Pionus maximiliani</i>	2	1993	1	Salt Lake Tracy
White-capped Parrot <i>Pionus senilis</i>	1	1993	1	San Antonio
Bronze-winged Parrot <i>Pionus chalcopterus</i>	17 (8)	1990-94	3	Sacramento: 8 (3), 5
Cuban Amazon <i>Amazona l. leucocephala</i>	9 (1)	1990-91	1	Miami MZ
Grand Cayman Amazon <i>A. leucocephala caymanensis</i>	2 (2)	1983	1	San Diego
Hispaniolan Amazon <i>Amazona ventralis</i>	3 (2)	1980	1	Monroe
White-fronted Amazon <i>Amazona albifrons</i>	26 (5)	1985-92	2	Tuscon ASDM: 24 (5), 8
Western White-fronted Amazon <i>A. a. albifrons</i>	1	1983	1	San Antonio
Green-cheeked Amazon <i>Amazona viridigenalis</i>	90 (16)	1970, 1978, 1980-84	12	Gainesville: 24 (2), 10
Lilac-crowned Amazon <i>Amazona finschi</i>	24 (1)	1979, 1981, 1984-93	3	Tampa: 12, 7
Yellow-cheeked Amazon <i>*Amazona a. autumnalis</i>	28 (6)	1984-85, 1987, 1989, 1991-94	2	Tampa: 18 (6), 8

Festive Amazon <i>Amazona festiva</i>	1	1985	1	Tampa
Western Festive Amazon <i>A. f. festiva</i>	2	1980-81	1	Tampa
Bodin's Amazon * <i>A. f. bodini</i>	1	1993	1	Salt Lake Tracy
Yellow-shouldered Amazon <i>Amazona barbadensis</i>	6	1989, 1992	2	Jackson: 3, 2 NY Bronx SCWCC: 3, 2
Blue-fronted Amazon <i>Amazona aestiva</i>	53 (3)	1970-72, 1974-77, 1979-81, 1984-85, 1987, 1989-94	8	Tampa: 34 (2), 6
Southern Blue-fronted Amazon <i>A. a. xanthopteryx</i>	1	1994	1	Lufkin
'Yellow-fronted Amazon (<i>Amazona ochrocephala</i>)' * <i>Amazona</i> sp.	44 (1)	1962, 1970, 1979, 1982, 1984-85, 1989, 1991-94	10	Chicago LP: 11, 4
Yellow-naped Amazon <i>Amazona auropalliata</i>	2	1972, 1994	2	Lansing Tampa
Panama Amazon <i>Amazona o. panamensis</i>	9 (1)	1980-82, 1986	1	Boston
Yellow-fronted Amazon <i>A. o. ochrocephala</i>	1 (1)	1975	1	San Francisco
Yellow-headed Amazon * <i>Amazona o. oratrix</i>	85 (10)+	1960, 1966-69, 1972, 1974-77, 1979-81, 1983-92, 1994	11	Fort Worth: 24 (3), 10
Tres Marias Amazon <i>A. o. tresmariae</i>	3	1985, 1987	1	Salt Lake Hogle
Belize Amazon <i>A. o. belizensis</i>	2 (2)	1987	1	New Orleans
Orange-winged Amazon <i>Amazona amazonica</i>	56 (8)	1967-69, 1975-80, 1983-85, 1987, 1989, 1992-93	3	Tampa: 41 (2), 13
Mainland Orange-winged Amazon <i>A. a. amazonica</i>	5	1972, 1974	1	Tampa
Mealy Amazon <i>Amazona farinosa</i>	2	1986, 1988	2	Phoenix Portland
Guatemalan Mealy Amazon * <i>A. farinosa guatemalae</i>	3 (3)	1986-87	1	New Orleans
St. Vincent Amazon <i>Amazona guildingii</i>	3 (2)	1972-73	1	Houston
<i>A. dufresniana rhodocorytha</i> x <i>A. finschi</i>	2	1972	1	Tampa
Hawk-headed Parrot <i>Derophtyas accipitrinus</i>	129 (15)+	1964-69, 1986-94	9	San Antonio: 36 (8), 8
Southern Hawk-headed Parrot <i>D. a. accipitrinus</i>	+	1963	1	Tampa

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* * *

HELP URGENTLY NEEDED

Only about 250 Wattled Cranes *Bugeranus carunculatus* remain in South Africa. To help ensure their survival, the Endangered Species Trust, which incorporates the S. A. Crane Working Group, is appealing for donations towards an education programme to make farm workers aware of the importance of conserving South African cranes by protecting wetlands and preventing the poisoning of these birds. Donations will also be used to help support the Wattled Crane Reintroduction Programme. Other endangered species are the Blue or Stanley Crane *Anthropoides paradisea* and the Crowned Crane *Balearica regulorum*. Information about the S. A. Crane Working Group is available from Dr John Ledger, Director, Endangered Wildlife Trust, Private Bag XII, Parkview 2122, South Africa, to whom donations can be sent.

COLLATED DATA ON THE FAWN-BREASTED WAXBILL

Estrilda paludicola

by Neville Brickell

The Fawn-breasted Waxbill is also known as the Buff-bellied or Marsh Waxbill, with *E. p. ochrogaster* being known as the Abyssinian or Ethiopian Fawn-breasted Waxbill.

This species measures 10cm-11cm (approx. 4in-4 $\frac{1}{4}$ in) long. Six races are described, the nominate race having the forehead, crown and nape brown washed with grey. The mantle, back and wing-coverts are reddish brown, with the lower rump and upper tail-coverts red, and the tail black. Its cheeks are light buffish grey, the chin and throat are yellowish white, with much of the remainder of the underparts pale buff, with a rose coloured belly patch (in the case of the male) and yellowish buff under tail-coverts. The irides are red or reddish brown. The bill is orange red, and the legs and feet are dark brown. The female is paler below and lacks the rose colouring present on the male's belly, which in the female is white. The juvenile is similar to the female, except that it has a dark bill.

Field characteristics

A small brown bird with a bright red bill and rump, and buffish, whitish or pale greyish face and underparts (Goodwin, 1982).

Status, distribution and geographical variations

The Fawn-breasted Waxbill is local and generally uncommon. The nominate race occurs from northern Zaire to Uganda, western Kenya and southern Sudan.

The other races are:

E. p. roseicrissa found in south-west Uganda and north-west Tanzania, differs from *E. p. paludicola* in having the forehead to the nape uniform brown with the mantle, and in having paler grey underparts.

E. p. ochrogaster from Ethiopia and south-eastern Sudan, differs from *E. p. paludicola* in having the underparts heavily suffused with rich golden buff.

E. p. marwitzi from Shinyanga, south of Lake Victoria, and the Iringa highlands of Tanzania, differs from *E. p. paludicola* in having the upperparts darker brown and the chin and breast grey.

E. p. benguellensis from Angola, northern Zambia and extreme south-west Tanzania, differs from *E. p. paludicola* in having the crown darker grey and the lower rump and upper tail-coverts brighter red.

E. p. ruthae from Bolobo to Lukolela and Kunungu in central Zaire differs

from *E. p. paludicola* in having the upperparts pale tawny brown and the underparts almost white (Clements et al. 1993; Howard and Moore, 1991).

Voice

There are various descriptions, with the commonest contact call described as a nasal 'tyeek', 'tyeep' or 'tsyee' and the alarm call as 'tsyee-koo' and 'kr-yee-eh' (Immelmann et al.).

Habitat and general habits

Inhabits moist grasslands, forest edges, and clearings, usually near streams and sometimes around villages and cultivation. *E. p. ochrogaster* does not occur on the open plateau, but inhabits upland regions of Ethiopia. In the Central African Republic the habitat is described as savanna woodland with *Terminalia laxiflora* (an important timber tree) (Carroll, 1988; Clement et al. 1993; Goodwin, Gledhill, 1972). It usually occurs in small or larger flocks of up to 30 birds, often in the company of other *Estrilda* spp. In captivity the Fawn-breasted Waxbill has been observed as being a lively bird, showing no signs of being shy or nervous and fond of perching on upright reed stems (Goodwin).

Food

Feeds largely on the seeds of grasses, as well as eating other forms of vegetable matter and occasionally taking insects. In captivity it will eat termites, wasp larvae or 'grubs', gnats and ant pupae, also the seeds of home grown green millet (Brickell and Konigkramer, 1997; Goodwin; Scherterleib, 1961). This waxbill will also eat spouted seed, especially panicum millet and spray millet, and seeding Chickweed *Stellaria media* (Rutgers and Norris, 1977). In South Africa it will accept Guinea Grass *Panicum maximum* and Blue Panic *P. laevifolium* (Brickell and Konigkramer)

Display

Males have been observed performing the mating display with and without nesting symbols held in the bill, but probably they normally display with nesting material in the usual way (Goodwin; Immelmann et al. 1965).

Breeding

Constructs a roundish nest of dry grasses, with a downward sloping entrance tube approximately 2.5cm (1in) long, about 10cm (4in) above the ground in tall tufts of grass. This description presumably also includes an unfinished 'cock's nest' above the roof of the real nest (Goodwin; Vincent, 1949). *E. p. benguellensis* has been recorded nesting in thick growth such as Bracken Fern *Pteridium aquilinum* and wild Ginger *Aframomum* sp.

(Brickell and Konigkramer, 1997). Clutches, on average, number four to six eggs, with a record of 10, probably being due to two females laying in the same nest (Weekes in Goodwin). Goodwin also refers to a whydah's egg, probably that of the Pin-tailed species *Vidua macroura*, found in a nest together with four of the host's eggs.

Peter Paris is credited with the first captive breeding in the UK in 1971 (Coles). Scherterleib was successful in Switzerland with his birds housed in a thickly planted open aviary (Rutgers and Norris, 1977). The first recorded breeding in South Africa occurred in 1973. Besides a few well developed small bushes, the aviary contained some large clumps of Eulalia Grass *Miscanthus sinensis* which can grow up to 4m (13ft) tall. The nests were made entirely of Guinea Grass *Panicum maximum*, lined with Natal Redtop *Rhyncheltrum repens* which was supplied on a daily basis. The second nest, in 1974, like the first the year before, contained no feathers. The first clutch of four eggs was laid in November and the second the following year, also consisting of four eggs, was laid in December. Incubation periods of 13 days and nestling periods of 20 and 21 days were recorded (Campbell pers. comm.).

Hybrids

According to Restall (1975) the Fawn-breasted Waxbill has hybridized with the Orange-cheeked Waxbill *E. melpoda*.

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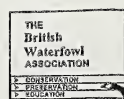
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KEEPING AND BREEDING THE TARTIC HORNBILL

Juan Conejo, a Spanish biologist, who made a study of the Purple-bellied Parrot *Triclarina malachitacea* and published the results in the *Avicultural Magazine* (Vol. 105, No. 1: 26-39), has returned recently from working on conservation programmes in the Philippines. While there he participated in the captive breeding of the Tartic Hornbill *Penelopides panini panini* and is keen to obtain more information about the keeping and breeding of this species. If you can help and would like to correspond with him about this or the Purple-bellied Parrot, Juan Conejo can be contacted at:- Hoyarrasa 30, Alcobendas, 28109, Madrid, Spain. Fax: 00-34-1-650.61.86/E-mail: conejo_juan@hotmail.com.

RAPTORS 2000

Raptors 2000, a joint meeting of The Raptor Research Foundation and The World Working Group for Birds of Prey, will take place April 2nd - 8th 2000, at Eilat, Israel. Further details are available from the Conference Secretariat: Ortra Ltd., 1 Nirim Street, PO. Box 9352, Tel Aviv, Israel. Tel: +972-3-6384444/ Fax: +972-3-6384455/E-mail: raptors@ortra.co.il/ Website: www.ortra.com/raptors 2000. There will be pre- and post-conference excursions to see Hume's Tawny Owl *Strix butleri*.

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